Maintaining and Troubleshooting the Gateway ALR 9200 Server

Notices

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Preface

Contents

About This Guide

This document provides step-by-step installation instructions along with detailed illustrations to help maintain the hardware components and peripherals of the computer.

Chapter 1: System Access provides instructions on opening and closing the case.

Chapter 2: Components covers information on maintaining, replacing, and upgrading the components in the system. This section includes information about options for the system and installation instructions.

Chapter 3: Installing Components describes the procedures for installing or replacing the hardware components.

Chapter 4: Jumpers and Drivers describes setting the jumpers and provides basic information about operating systems and software.

Chapter 5: BIOS Setup briefly explains the system basic input/output system (BIOS) and provides instructions on how to update the BIOS.

Chapter 6: The Server Setup Utility describes the system setup utility and provides instructions on using it to set up the server.

Chapter 7: Other Utilities describes the other utilities provided with the system and provides instructions for their use.

Chapter 8: Troubleshooting provides reference material on troubleshooting your system.

Conventions Used in This Guide

Throughout this document, you will see the following conventions:

Convention	Description
ENTER	Key names, which correspond to keys on the keyboard, are printed in small capitals.
CTRL+ALT+DEL	A plus sign indicates that the keys must be pressed simultaneously.
Setup	Commands to be entered, options to select, and messages that appear on your monitor are printed in bold.
User's Guide	Names of publications and files are printed in italic.
Sidebars ● *Note:* This is an example of an important note that may appear in the manual.	Sidebars give critical information such as warnings and important notes.

Important Safety Instructions

Observe the following guidelines when performing any work on your system:

- Follow all instructions marked on the server and in the documentation.

- Unplug this product from the wall outlet before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning.

- Do not use this product near water. Do not spill liquid on or into the server.

- Do not place the server on an unstable surface.

- Openings in the system cabinet are provided for ventilation. Do not block or cover these openings. Do not place the server near or upon a radiator or heat register.

- Use only the power source shown on the power supply. If you are not certain about the power source, ask the local power company.

- The server is equipped with a 3-wire grounding plug (a plug with a grounding pin). This plug only fits into a grounded power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace the outlet.

- Do not walk on the power cord or allow anything to rest on it.

- If you use an extension cord with this system, make sure the total ampere ratings on the products plugged into the extension cord do not exceed the extension cord ampere rating. Also, the total ampere requirements for all products plugged into the wall outlet must not exceed 15 amperes.

- Never insert objects of any kind into the system ventilation slots.

- Unplug the system from the wall outlet and refer servicing to qualified personnel if:
  - The power cord or plug is damaged.
  - Liquid has been spilled into the system.
  - The system does not operate properly when the operating instructions are followed.
  - The system was dropped or the cabinet is damaged.
  - The system's performance changes.

System Access

Contents

Static Electricity Precautions

Static Electricity Preventions

1. WEAR A GROUNDING WRIST STRAP (available at most electronic stores).
2. Turn off the system power.
3. Touch the back of the power supply fan, located on the back of the case.
4. UNPLUG ALL CORDS FROM WALL OUTLET.
5. Remove the system case cover.

Static Electricity Precautions

♦ Avoid static-causing surfaces such as plastic and styrofoam in your work area.

♦ Remove the parts from their antistatic bags only when you are ready to use them. Do not lay parts on the outside of antistatic bags since only the inside provides antistatic protection.

♦ Always hold cards by their edges and their metal mounting bracket. Avoid touching components on the cards and the edge connectors that connect to expansion slots.

♦ Never slide cards or other parts over any surface.

Opening the System

Depending on your purpose, you may need to remove the access cover or both the access cover and the bezel. You may also need to open the subchassis or the electronics bay to reach certain components. Follow the instructions specific to the item you wish to remove or open as indicated in each section.

Removing the Access Cover

You need to remove the system access cover to reach components inside the system. Facing the front of the system, the access cover is on the right side of the server.

To Remove the Access Cover

1. Observe the ESD precautions in "Static Electricity Precautions" on page 2.

2. Turn off all peripheral devices connected to the system.

3. Turn off the system by using the power on/off switch on the front panel and unplugging all AC power cords.

4. Label and disconnect all peripheral cables attached to the input/output (I/O) panel on the back of the system.

▼ *Caution!*

Power the system off and disconnect all power cords before proceeding. Installing any component while the power is on may cause permanent damage to the system.

5. Remove and save the three screws from the back of the access cover (see Figure 1); you will need them later to reattach the cover.
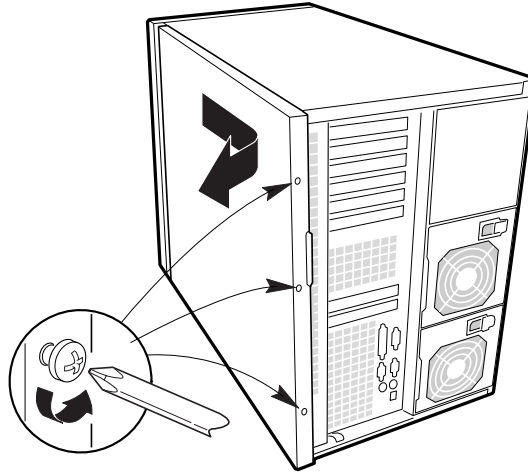
Figure 1: Removing the Access Cover

6. Place the fingertips of your right hand under the built-in handle on the back of the cover. A rounded, rectangular depression in the front middle of the access cover serves as another handle.

7. Using an even pull, slide the cover backward, about an inch, until it stops.

8. Pull the entire cover outward, straight away from the chassis, to disengage the rows of tabs from the notches in the top and bottom edges of the chassis. Set the cover aside.

Opening the Front Door

The front door is secured to the bezel by a key lock. This lock has three positions: fully locked, front door unlocked, and front and access cover unlocked. When the front door is unlocked, you can remove it by opening it fully and lifting the hinges out of the slots that hold them.

Opening the Subchassis and Electronics Bay

The chassis is comprised of three parts: the main chassis, a swing-out subchassis at the front, and a swing-out subchassis, called the electronics bay, at the rear. To access components in some instances, you must remove the foam covers and swing away and/or completely remove the subchassis and electronics bay.

To open the subchassis and electronics bay, you must first remove the foam covers. The subchassis and electronics bays are secured using phillips head screws.

To Open the Subchassis and Electronics Bay

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Turn off all peripheral devices connected to the system.

3. Turn off the system power by using the power on/off switch on the front panel and unplugging all AC power cords.

4. Label and disconnect all peripheral cables attached to the I/O panel on the back of the system.

5. Remove and save the three screws from the back of the access cover; you will need them later to reattach the cover.

6. Remove the access cover.

7. Remove the foam blocks by pulling them out of the subchassis and electronics bay. These blocks form an important part of the airflow and electromotive compatibility (EMC) characteristics of the system. The foam in the subchassis also forms the support structure for most of the system fans.

8. Loosen the two screws on the top and bottom edges of the chassis (A in Figure 2). These screws attach the front subchassis and the electronics bay to the main chassis.
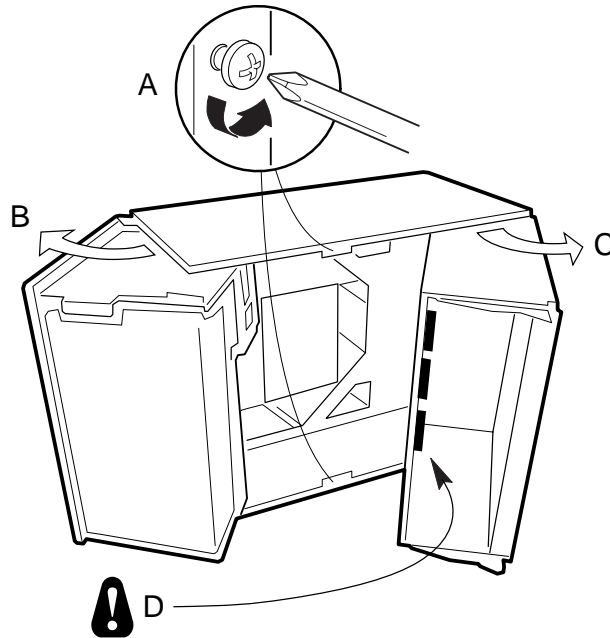
Figure 2: Opening the Subchassis and Electronics Bay

9. Using the edges of the subchassis as handles, rotate the front subchassis left, away from the main chassis, until it stops (B in Figure 2).

10. Disconnect all cabling to the electronics bay (D in Figure 2).

11. Using the vertical edge of the electronics bay as a handle, rotate the bay right, away from the main chassis, until it stops (C in Figure 2).

12. If necessary, completely remove the subchassis and electronics bay: rotate the bays outward until the two pins that function as hinges for the bays slide out of their slots. Set the bays aside.

Closing the System

Before closing the system, verify that all connectors and boards are properly installed and firmly seated.

Closing the Subchassis and Electronics Bay

As you close the subchassis and electronics bay, carefully observe the internal components to ensure that you do not pinch or twist any of the cables or components.

To Close the Subchassis and Electronics Bay

1. Verify that all internal components are fully installed and secured.

2. Press down on the tab on the top of the electronics bay to release it and swing it closed.

3. Attach any cables to the electronics bay components.

4. Press down on the tab at the top of the subchassis to free it and swing it closed.

5. Secure the subchassis with the two screws you removed earlier.

6. If necessary, reinstall the foam bracketing for the fans in the subchassis and reinstall the fans.

7. Reinstall the foam over the subchassis and electronics bay.

8. Replace the access cover and power up the system.

Installing the Access Cover

Be careful to avoid pinching any internal cables in the access cover when closing the system.

● *Note:*

The bezel key lock must be in the open position before reinstalling the access cover.

To Replace the Access Cover

1. Before replacing the access cover, check that you have not left loose tools or parts inside the system.

2. Check that cables, expansion cards, foam pad, and other components are properly installed.

3. Position the cover over the chassis so that the rows of tabs align with slots in the chassis. While pressing inward, slide the cover toward the front of the system until the tabs on the cover firmly engage in the chassis.

4. Attach the cover to the chassis with the three screws you removed earlier, and tighten them firmly.

5. Connect all external cables and the power cords to the system.

Installing the Front Door

To replace the front door, insert the hinges into the slots on the front of the chassis and close the door. Secure it by turning the bezel keylock to the second locked position. The first position allows you to open the front door and locks the side access panel. The fully locked position prevents all access to the system controls by locking both the access panel and the bezel door.

Components

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System Board Features

The system board functions as the main interface between the processor, memory, and peripherals.

Table 1 lists the features of the system board. Figure 3 on page 11 shows the components on the system board and their locations.

Table 1: System Board Features

Feature	Description
Processor	Installed: Up to four Pentium® II Xeon™ processors, in single edge contact (SEC) cartridges installed in Slot 2 connectors. Includes connectors for six VRM 8.3-compliant plug-in voltage-regulator modules (VRMs).
Main memory	Single plug-in module containing 16 dual in-line memory module (DIMM) sockets for up to 4 GB of extended data output (EDO) dynamic random access memory (DRAM). Installed: 256 MB–4 GB of EDO error correcting code (ECC) random access memory (RAM).
Video memory	Installed: 2 MB of video memory.
PCI bus(es)	PCI-A—Three expansion connectors PCI-B—Four expansion connectors (one shared with the ISA slot)
ISA bus	One expansion slot for expansion boards (shared with a PCI-B slot).
Server management	Thermal/voltage monitoring and error handling. Front panel controls and indicator light emitting diodes (LEDs).
Graphics	Integrated onboard Cirrus Logic GD5480 super video graphics array (SVGA) controller.
SCSI	Two embedded small computer systems interface (SCSI) controllers: Symbios SYM53C810AE—narrow SCSI controller providing support for legacy 8-bit SCSI devices Symbios SYM53C896—dual-channel wide low voltage differential (LVD)/single-ended (SE) (ultra2/ultra) SCSI controller driving one SCSI backplane in the system and providing support for external expansion.
System I/O	PS/2-compatible keyboard and mouse ports, parallel port, video port, USB port, and two serial ports (serial port 1 is the left connector).

System Board Connectors

Figure 3 shows the connectors on the system board. Some of these connectors may not be used, depending on the configuration of the server. The table below provides the key to Figure 3.
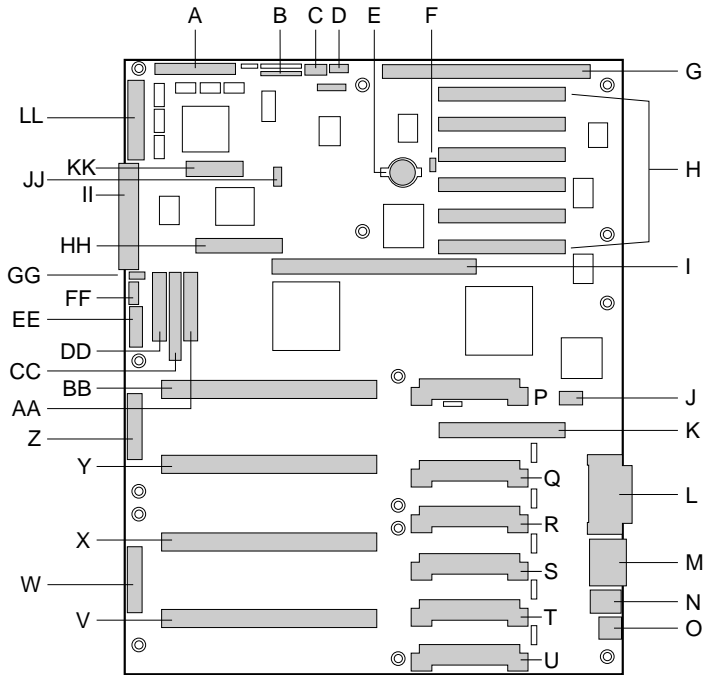
Figure 3: System Board Components and Connectors

A	Wide SCSI B connector (J9J1)	T	VRM connector for processors 2 & 1 (J4A2)
B	System jumpers (J6J1)	U	VRM connector for processor 1 (J4A1)
C	Hard drive input LED connector (J6J3)	V	Processor 1 Slot 2 connector (J9A1)
D	System speaker connector (J6J2)	W	Main power connector, primary (J9B1)
E	Lithium battery (B4H1)	X	Processor 2 Slot 2 connector (J9B2)
F	Wake-on-LAN technology connector (J4H1)	Y	Processor 3 Slot 2 connector (J9D1)
G	ISA slot (J1J1)	Z	Main power connector, secondary (J9D2)
H	PCI slots B4 (top), B3, B2, B1, A3, and A2	AA	Front panel connector (J8E1)
I	Memory module connector (J3G1)	BB	Processor 4 Slot 2 connector (J9E1)
J	ICMB connector (J1E1)	CC	IDE connector (J9E2)
K	PCI slot A1 (J2D1)	DD	Diskette drive connector (J9E3)
L	Video and parallel port connectors (J1C1)	EE	Auxiliary power connector (J9E4)
M	Serial port connectors (J1B2)	FF	USB internal header (JC9F14)
N	Keyboard and mouse connectors (J1B1)	GG	SMBus connector (J9F2)
O	USB external connector (J1A1)	HH	F16 expansion connector (J7G1)
P	VRM connector for processor 4 (J4E1)	II	Narrow SCSI connector (J9H1)
Q	VRM connector for processors 4 & 3 (J4C2)	JJ	External IPMB connector (J7H1)
R	VRM connector for processor 3 (J4C1)	KK	SMM connector (J8H1)
S	VRM connector for processor 2 (J4B1)	LL	Wide SCSI A connector (J9H2)

Drive Controllers and Connectors

The system board supports several controllers and connectors for the control of the various drives that are or can be installed in the system.

SCSI Connectors

The system board includes two SCSI controllers. A narrow SCSI controller (SYM53C810AE) is on the PCI-A bus, and a dual-channel wide LVD/SE (Ultra2/Ultra) SCSI controller (SYM53C896) is on the PCI-B bus. The narrow controller provides support for legacy 8-bit SCSI devices that may be installed in the 5.25-inch drive bays. The wide controller drives one SCSI backplane and provides support for external expansion.

Each controller has its own set of PCI configuration registers and SCSI I/O registers. As a PCI 2.1 bus master, the wide controller supports burst data transfers on PCI up to the maximum rate of 132 MB/sec using on-chip buffers.

No logic, termination, or resistor loads are required to connect devices to the SCSI controller other than termination in the device at the end of the cable. The SCSI bus is terminated on the system board with active terminators that can be disabled.

Wide SCSI A (LL) and Wide SCSI B Connectors (A)

Internally, each wide channel is identical, capable of operations using either 8- or 16-bit SCSI providing 10 MB/sec (Fast-10) or 20 MB/sec (Fast-20) throughput, or 20 MB/sec (Ultra) or 40 MB/sec (Ultra-wide).

The wide controller contains a high-performance SCSI bus interface. It supports SE mode with 8-bit (10 or 20 MB/sec) or 16-bit (20 or 40 MB/sec) transfers and LVD mode with 8-bit (40 MB/sec) or 16-bit (80 MB/sec) transfers.

Narrow SCSI Connector (II)

The narrow controller contains a high-performance SCSI core capable of Fast 8-bit SCSI transfers in single-ended mode. It provides programmable active negation, PCI zero wait-state bursts of faster than 110 MB/sec at 33 MHz, and SCSI transfer rates from 5 to 10 MB/sec.

IDE Connector (CC)

This is an integrated Ultra-DMA PCI/IDE interface with an IDE connector capable of controlling up to two IDE devices. Ultra-DMA provides faster access to IDE devices that are Ultra-DMA compliant while maintaining support for IDE devices that do not support the Ultra-DMA specification.

The IDE controller supports:

- PIO and IDE DMA/bus master operations
- Mode 4 timings
- Transfer rates up to 33 MB/sec
- Buffering for PCI/IDE burst transfers
- Master/slave IDE mode
- Up to two drives for one IDE channel

Diskette Drive Connector (DD)

The diskette drive controller and connector on the system board can support up to two diskette drives of 1.44-MB and 2.88-MB formats.

System Jumpers (B)

These jumpers allow you to set certain characteristics of the system. Some jumpers are reserved and are not described in this section. Do not change any jumper unless it is necessary to configure the system. In some cases, changing the settings of reserved jumpers can cause damage to the system board.

Clear CMOS Jumper

This jumper allows you to clear the complimentary metal-oxide semiconductor (CMOS) memory. You should only do this if you cannot access the normal methods of modifying the CMOS and modifications to the CMOS are necessary. Clearing CMOS memory returns all BIOS Setup settings to the default values. This jumper occupies pins 1-3 of the connector. See "Setting the Jumpers" on page 72 for more information on setting the CMOS clear jumper.

● *Note:*

You can connect an IDE signal cable, up to a maximum of 18 inches, to the IDE connector on the system board. The cable can support two devices, one at the end of the cable and one six inches from the end.

Password Clear Jumper

Momentarily setting this jumper allows you to clear the passwords. The normal jumper position protects the passwords. Use this jumper only if you have forgotten the passwords and cannot access the system. This jumper occupies pins 5-7 of the connector. See "Setting the Jumpers" on page 72 for more information on setting the password clear jumper.

Recovery Boot Jumper

The recovery boot jumper should be used only in the event of a failed BIOS update. If you attempt a BIOS update and the update fails, set this jumper and reboot the system. The system attempts to recover the previous version of the BIOS as it boots up. This jumper occupies pins 9-11 of the connector. See "Setting the Jumpers" on page 72 for more information on setting the recovery boot jumper.

Miscellaneous Connectors

Hard Drive Input LED Connector (C)

This connector allows you to connect a cable from an add-in hard disk controller to the system board to allow the add-in controller to activate the hard drive activity LED on the control panel.

System Speaker Connector (D)

Connects the internal speaker to the system board.

Wake-on-LAN Technology Connector (F)

The wake on local area network (LAN) technology connector allows you to connect a magic packet-enabled LAN adapter to the system board to support wake on LAN functionality. Wake on LAN functionality allows a system in power conservation mode to be awakened by an incoming message on the network.

Front Panel Connector (AA)

The front panel connector provides the signals for the front cover indicator LEDs and the front cover buttons.

USB Internal Connector (FF)

This connector allows you to connect internal devices that use the USB interface to the USB controller on the system board.

Lithium Battery (E)

Provides the power to maintain the CMOS memory when the system is turned off or unplugged.

Expansion Slot Connectors

ISA Slot (G)

The system board has one industry standard architecture (ISA) slot that is full-length if you do not use the wide SCSI-B connector (and half-length if you use the wide SCSI-B connector); the ISA slot supports slave-only boards and is shared with PCI-B slot 4. The ISA bus also supports three embedded devices: the Super I/O chip, system board management controller (BMC), and flash memory for the system BIOS. ISA bus features:

- Bus speed up to 8.33 MHz
- 16-bit memory addressing
- Type A transfers at 5.33 MB/sec
- Type B transfers at 8 MB/sec
- 8- or 16-bit data transfers
- Plug and Play ready

PCI slots B4 (top), B3, B2, B1, A3, A2 (H), A1 (K)

The system board has two 32-bit peripheral component interconnect (PCI) bus segments: PCI-A and PCI-B. These provide seven slots for PCI expansion cards: three on PCI-A and four on PCI-B. PCI-B4 is shared with the ISA slot. PCI-A1 supports half-length boards only. The other slots support full-length boards. PCI bus features:

- 33 MHz bus speed
- 32-bit memory addressing
- 5 V signaling environment
- Burst transfers of up to 133 MB/sec
- 8-, 16-, or 32-bit data transfers
- Plug and Play ready
- Parity enabled

Memory Module Connector (I)

The memory module connector supports the memory module. The memory module is a proprietary card that supports all of the main memory for the system. The memory module is described in "Memory" on page 23.

System Management Connectors

Server Management features are implemented using one microcontroller, the system board management controller (BMC).

The BMC and associated circuitry are powered from the 5 V standby line, which remains active when the system power is switched off.

The primary function of the BMC is to autonomously monitor system management events and log their occurrence in the nonvolatile system event log (SEL). These events include overtemperature and overvoltage conditions, fan failure, or chassis intrusion. While monitoring, the BMC maintains the nonvolatile sensor data record repository (SDRR), from which run-time information can be retrieved. The BMC provides an ISA

host interface to SDRR information, so software running on the server can poll and retrieve the current status of the hardware. A shared register interface is defined for this purpose.

SEL contents can be retrieved after system failure for analysis by field service personnel using system management tools like Intel® LANDesk® Server Manager. Because the BMC is powered by 5V_Standby, SEL (and SDRR) information is also available via the interperipheral management bus (IPMB). An emergency management board like the Intel LANDesk server management module (SMM) board can obtain the SEL and make it remotely accessible using a LAN or telephone line connection.

During monitoring, the BMC performs the following functions:

- System board temperature and voltage monitoring
- Processor presence monitoring and fault resilient boot (FRB) control
- System board fan failure detection and indicator control
- SEL interface management
- SDRR interface management
- SDR/SEL timestamp clock
- System board field replaceable unit (FRU) information interface
- System management watchdog timer
- Periodic system management interrupt (SMI) timer
- Front panel non-maskable interrupt (NMI) handling
- Event receiver
- ISA host and IPMB interface management
- Secure mode control, front panel lock/unlock initiation, and video blank and diskette write protect monitoring and control
- Sensor event initialization agent
- Wake-on-LAN via Magic Packet support
- ACPI Support
- Emergency Management Port (EMP) support

ICMB Connector (J)

The intelligent chassis management bus (ICMB) connector allows the connection of a system management component to monitor the chassis characteristics including temperature, voltages, intrusion detection, and fan speeds.

SMBus Connector (GG)

This connector supports an SMBus card that provides system management functions.

F16 Expansion Connector (HH)

The F16 expansion connector allows you to connect a component to the F16 bus which communicates between the memory and I/O controller (MIOC) and the PCI expansion bridge (PXB).

External IPMB connector (JJ)

This connector allows you to connect an "external" device to the IPMB to help determine the cause of a system failure from a remote terminal.

SMM connector (KK)

The SMM connector allows you to connect a system management module to the system board to monitor the system and perform other system management functions.

Back Panel I/O Connectors

Video Port Connector (L)

The onboard, integrated Cirrus Logic CL-GD5480 64-bit VGA chip contains an SVGA controller that is fully compatible with the VGA video standard. The system board provides 2 MB of 10 ns onboard video

memory. The video controller supports pixel resolutions of up to
1600 x 1200 and up to 16.7 M colors. You cannot add video memory to this
system.

The SVGA controller supports analog VGA monitors (single and multiple
frequency, interlaced and noninterlaced) with a maximum vertical retrace
noninterlaced frequency of 100 Hz. Depending on the environment, the
controller displays up to 16.7 M colors in some video resolutions.

Compatible video drivers are provided with the operating system or the
utilities.

Parallel Port Connector (L)

The 25/15-pin connector stacks the parallel port beside the VGA video port.
BIOS programming of the super I/O chip registers enables the parallel port
and determines the port address and interrupt. The system BIOS provides
fields in the setup utility to easily enable the parallel port and set the port
address and interrupt. When disabled, the interrupt is available to expansion
cards.

Serial Port Connectors (M)

Both serial ports are relocatable. By default, port 1 is the left connector,
port 2 on the right. Each serial port can be set to one of four different
COMx ports, and each can be enabled separately. The system BIOS
provides fields in the setup utility to easily enable both serial ports and set
the port addresses and interrupts. When disabled, serial port interrupts are
available to expansion cards.

Keyboard and Mouse Connectors (N)

The PS/2-compatible keyboard and mouse connectors are mounted in a
single-stacked housing with the mouse connector to the left of the
keyboard. External to the system, they appear as two connectors.

You can plug in the keyboard and mouse to either connector before
powering up the system. BIOS detects the device connected at each
connector and configures the keyboard controller accordingly.

The keyboard controller is functionally compatible with the 8042A microcontroller. The system can be locked automatically if no keyboard or mouse activity occurs for a predefined length of time, if specified through the SSU. Once the inactivity (lockout) timer has expired, the keyboard and mouse do not respond until the previously stored password is entered.

USB External Connector (O)

One universal serial bus (USB) port provides connection for a growing list of peripheral components including mouse, keyboard, joystick, monitor, tape and diskette drives. Up to 127 devices can be daisy-chained from the port. The USB port also provides hot-swap capability and dynamic resource allocation for all peripherals attached to it with data transfer rates of up to 12 Mbps. USB drivers are provided as a part of most major operating systems and should require no special procedures for implementation or use.

Processors and Related Connectors

VRM Connectors (P, Q, R, S, T, U)

In this system each processor must have one VRM to adjust the voltage supplied to the processor core and one to adjust the voltage supplied to the second-level cache in the SEC cartridge. The first VRM is dedicated to a single processor and provides the correct power to the processor core. The second VRM provides power to the integrated second-level cache and can support the cache on two SEC cartridges. Therefore each processor requires 1.5 VRMs. See Table 2 for the allowed processor and VRM configurations.

Table 2: Processors and VRMs

Processor Installed	VRM Installed	VRM Function
Processor 1	VRM 1	Powers the processor core for processor 1
	VRM 2	Powers the second-level cache for processors 1 and 2
Processor 2	VRM 3	Powers the processor core for processor 2
Processor 3	VRM 4	Powers the processor core for processor 3
	VRM 5	Powers the second-level cache for processors 3 and 4
Processor 4	VRM 6	Powers the processor core for processor 4

Processor Slots (V, X, Y, AB)

Each Pentium® II Xeon™ processor is packaged in a SEC cartridge. The cartridge includes the processor core with an integrated 16 KB primary (L1) cache; the secondary (L2) cache; a thermal plate; and a back cover. The processor implements MMX™ technology and maintains full backward compatibility with the 8086, 80286, Intel386™, Intel486™, Pentium, and Pentium Pro processors.

Each SEC cartridge connects to the system board through a Slot 2 edge connector. The cartridge is secured by a retention bracket attached to the system board. Depending on configuration, the server has one to four processors.

The processor external interface is multiprocessor (MP)-ready and operates at 100 MHz. The processor contains a local advanced programmable interrupt controller (APIC) for interrupt handling in MP and uniprocessor (UP) environments. The system SMP design supports up to four processors and is Intel MP Specification v1.1 and 1.4 compliant.

The second-level cache is located inside the SEC cartridge. The cache includes burst pipelined synchronous static RAM (BSRAM) and is offered in 512 KB, 1 MB, and 2 MB configurations, with ECC that operates at the full core clock rate.

Each processor cartridge requires two VRMs to provide power to the processor core and the second-level cache, respectively. The full details of the installation of processors and VRMs are provided in "VRM Connectors (P, Q, R, S, T, U)" on page 20.

Power Connectors

There are several power connectors that provide power for the system board. Some of these connectors provide power for specialized functions.

Main Power Connector, Primary (W)

The primary power connectors provide the majority of the power to the system board. These connectors are designed to accommodate the power supply installed in the system.

Main Power Connector, Secondary (Z)

The primary power connectors provide the majority of the power to the system board. These connectors are designed to accommodate the power supply installed in the system.

Auxiliary Power Connector (EE)

The auxiliary power connector provides for the connection of an additional power source.

Memory

The system comes standard with 256-MB of ECC RAM. System RAM is expandable up to 4-GB using ECC 50- or 60-ns 72-bit EDO DIMMs (16 DIMM sockets) with gold contacts.

Main memory resides on an expansion card, called a memory module, designed specifically for this server. The memory module contains slots for 16 DIMMs, each of which must be at least 32 MB, and is attached to the system board through a dedicated connector. Memory amounts from 128 MB to 4 GB of RAM are supported, with a 64/72-bit four-way-interleaved pathway to main memory.

The 16 slots are divided into four banks of four slots each, labeled A through D. These banks support 4:1 interleaving. The memory controller supports EDO DRAMs. The ECC used for the memory module is capable of correcting single-bit errors (SBEs) and detecting 100 percent of double-bit errors over one code word. Nibble error detection is also provided.
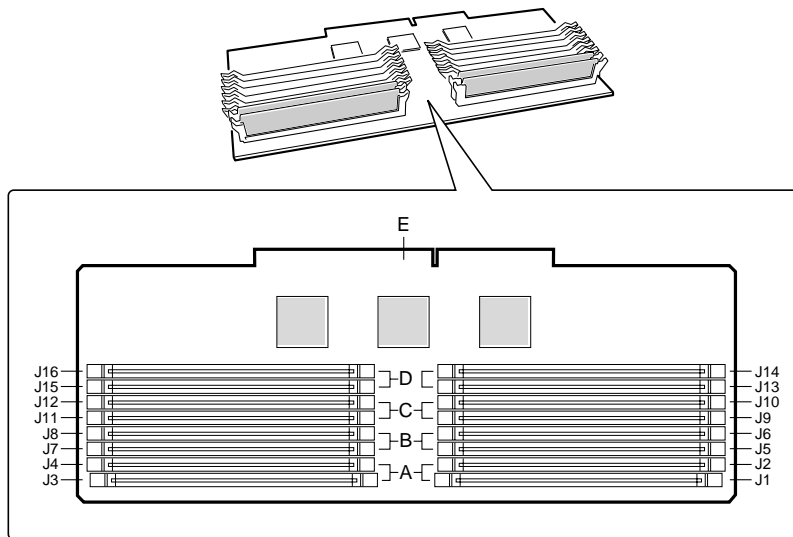
Figure 4: Memory Banks

● *Note:*

Each memory bank includes
two DIMM sockets in each
row of connectors. When
installing DIMMs, be careful
to install the DIMMs in the
correct sockets for the bank.

DIMM Installation Sequence

You must install DIMMs in the correct order and in entire banks. All
DIMMs in the bank must be the same size and speed. DIMMs in other
banks may differ in size. If you use slower DIMMs in another bank, all
DIMMs operate at the slower speed (see Figure 4 on page 23).

The sequence in which you must fill the banks is:

1. Memory bank A

2. Memory bank B

3. Memory bank C

4. Memory bank D

System Memory Addressing

System memory begins at address 0 and is continuous (flat addressing) up
to the maximum amount of DRAM installed (exception: system memory is
noncontiguous in the ranges defined as memory holes using configuration
registers). The system supports both base (conventional) and extended
memory.

- Base memory is located at addresses 00000h to 9FFFFh (the first
  1 MB).

- Extended memory begins at address 0100000h (1 MB) and
  extends to FFFFFFFFh (4 GB), which is the limit of supported
  addressable memory. The top of physical memory is a maximum
  of 4 GB (to FFFFFFFFh)

Memory holes can be configured in Setup or the SSU and are used by some
legacy ISA boards. If you do not need to set up a memory hole for an ISA
expansion board, leave the memory in a contiguous state for optimal
performance.

Memory Configuration

BIOS automatically detects, sizes, and initializes the memory array, depending on the type, size, and speed of the installed DIMMs, and reports memory size and allocation to the system via configuration registers.

In a 4 GB configuration, a small part of memory (typically 32 MB) is not remapped above 4 GB. If your OS does not support more than 4 GB of physical memory, this small part of the memory is effectively lost.

Table 3: Sample DIMM Component Combinations

Bank A (slots J1 - 4)	Bank B (slots J5 - 8)	Bank C (slots J9 - 12)	Bank D (slots J13 - 16)	Total Memory
4x64				256 MB
4x64	4x32			384 MB
4x64	4x32	4x32		512 MB
4x64	4x64			512 MB
4x64	4x64	4x32	4x32	768 MB
4x64	4x64	4x64	4x64	1024 MB
4x128	4x64	4x32	4x32	1024 MB
4x128	4x128	4x64	4x64	1536 MB
4x128	4x128	4x128	4x128	2048 MB
4x256	4x128	4x64	4x64	2048 MB
4x256	4x256	4x128	4x128	3072 MB
4x256	4x256	4x256	4x256	4096 MB

System Security

To help prevent unauthorized entry or use of the system, the system includes a three-position key lock/switch to permit selected access to drive bays (position is communicated to the BMC, see "System Management Connectors" on page 16). The system also includes server management software that monitors the chassis intrusion switch.

Mechanical Locks and Monitoring

The system includes a chassis intrusion switch. When the access cover is opened, the switch transmits an alarm signal to the system board, where server management software processes the signal. You can program a response to an intrusion, for example, the system may power down or lock the keyboard.

Software Locks via the SSU or BIOS Setup

The system setup utility (SSU) provides a number of security features to prevent unauthorized or accidental access to the system. Once the security measures are enabled, access to the system is allowed only after you enter the correct password(s). For example, the SSU allows you to:

- Enable the keyboard lockout timer so the server requires a password to reactivate the keyboard and mouse after a specified time-out period of 1 to 120 minutes
- Set and enable administrator and user passwords
- Set secure mode to prevent keyboard or mouse input and to prevent use of the front panel reset and power switches
- Activate a hot-key combination to enter secure mode quickly
- Disable writing to the diskette drive when secure mode is set

Using Passwords

If you set and enable a user password but not an administrator password, enter the user password to boot the system and run the SSU.

If you set and enable both a user and an administrator password:

- Enter either one to boot the server and enable the keyboard and mouse
- Enter the administrator password to access the SSU or BIOS Setup to change the system configuration

Secure Mode

Configure and enable the secure boot mode by using the SSU. When secure mode is in effect, you:

- Can boot the system and run the OS, but you must enter the user password to use the keyboard or mouse
- Cannot turn off system power or reset the system from the front panel switches

Secure mode has no effect on functions enabled via the Server Manager Module or power control via the real-time clock (RTC).

Taking the system out of secure mode does not change the state of system power. That is, if you press and release the power switch while secure mode is in effect, the system will not power off when secure mode is later removed. However, if the front panel power switch remains depressed when secure mode is removed, the system will power off.

Summary of Software Security Features

Table 4 lists the software security features and describes what protection each offers. In general, to enable or set the features listed here, you must run the SSU and go to the Security Menu (described in "Security Add-in" on page 116). The table also refers to other SSU menus and to the Setup utility. For more information on setting the security features, see "Security Menu" on page 92, and "Security Add-in" on page 116.

Table 4: Software Security Features

Feature	Description
Secure boot mode	To enter secure mode: Set and enable a password to automatically put the system into secure mode. If you set a hot-key combination, you can secure the system by pressing the key combination. This means you do not have to wait for the inactivity time-out period. See "Security Menu" on page 92. When the system is in secure mode: The system boots and runs the OS, but does not accept mouse or keyboard input until you enter the user password. At bootup, if the system detects a CD in the CD-ROM drive or a diskette in drive A, it requests a password. When you enter the password, the system boots from CD or diskette and disables secure mode. If you have not installed a CD-ROM drive or if there is no CD in the drive or diskette in drive A, the system boots from drive C and automatically enters secure mode. All enabled secure mode features go into effect at bootup. To leave secure mode: Enter the correct password(s).
Disable writing to diskette	In secure mode, the system will not boot from or write to a diskette unless a password is entered. To set these features, see "Security Menu" on page 92 and "Security Options" on page 117.
Disable the power and reset buttons	If you enable this protection feature in the SSU, the system disables the power and reset buttons when in secure mode. See "Security Options" on page 117.
Set a time-out period so that keyboard and mouse input are not accepted. Also, blank screen and inhibit writes to diskette	You can specify and enable an inactivity time-out period of from 1 to 120 minutes. If no keyboard or mouse action occurs for the specified period, keyboard and mouse input is not accepted. To set this feature, see "Security Menu" on page 92. If video blanking is enabled, the monitor display goes blank until you enter the correct password(s). To set this feature, see "Security Menu" on page 92.
Control access to the SSU: set administrator password	To control access to the system configuration, set an administrator password and enable it through Setup or the SSU. If both the administrator and user passwords are enabled, either can be used to boot the system or enable the keyboard and/or mouse, but only the administrator password allows changes to Setup and the SSU. Once set, passwords can be disabled by setting the password to a null string or by changing the Clear Password jumper. See "Security Add-in" on page 116 to set the password to a null string; or, to change the jumper, see "Password Clear Jumper" on page 75.

Table 4: Software Security Features (Continued)

Feature	Description
Control access to the system other than SSU: set user password	To control access to the system, set a user password and enable the Password on Boot field through Setup or the SSU. Once set, passwords can be disabled by setting the password to a null string or by changing the Clear Password jumper. See "Security Add-in" on page 116 to set the password to a null string; or, to change the jumper, see "Password Clear Jumper" on page 75.
Boot without keyboard	The system can boot with or without a keyboard. During POST and before the system boots, BIOS automatically detects and tests the keyboard, if present, and displays a message. No entry exists in the SSU for enabling or disabling a keyboard. Do not plug in a keyboard while power is applied to the system.
Specify the boot sequence	The sequence you specify in the BIOS (see "Boot Device Priority Submenu" on page 96) or the SSU (see "Multiboot Options Add-in" on page 115) determines the boot order. If secure mode is enabled (user password is set), you are prompted for a password before the system boots fully. If secure mode is enabled and the Secure Mode Boot option is also enabled, the system boots fully but requires a password before accepting any keyboard or mouse input.

Installing
Components

Contents

● *Note:*

If the server has less than four processors and you are adding one, then you must remove the termination board assembly from the next Slot 2 connector before you install the new processor. If you plan to reduce the number of processors in your system, then you must replace a processor with a termination board assembly.

Introduction

This chapter provides step-by-step instruction for installing, removing, or replacing several system components. Only authorized service personnel should perform these procedures. Follow all standard safety and ESD precautions when servicing the server. See "Static Electricity Precautions" on page 2 for more information on ESD precautions.

"Opening the System" on page 3 provides detailed instructions for opening the system. All procedures in this chapter assume that any necessary access covers have been removed and that the subchassis and electronics bays have been removed, if necessary.

Replacing the Processor

The system is compatible with Intel Pentium® II Xeon™ processors. You can either upgrade the existing Pentium II Xeon processor or install up to three more processors of the same speed and cache size as the first processor.

When replacing a processor, order a Pentium II Xeon processor upgrade kit. The kit includes the Pentium II Xeon processor, a heat sink, and latches.

It is critical that a heat sink be installed on each processor. The Pentium II Xeon processor overheats and fails if it is not cooled sufficiently. The heat sink provided with the processor in the system provides all necessary cooling for the processor.

For the latest details on the availability of the upgrade kits, contact one of the sources listed in the *Assistance Resources* document.

To Replace the Processor

1. Turn off the system and disconnect all the power cords.

2. Open the case, observing the static electricity precautions in "Static Electricity Precautions" on page 2 and remove the foam cover on the electronics bay.

3. Wear an anti-static wristband grounded to the system chassis and place processors on a grounded, static-free surface or conductive foam pad.

4. With your right thumb on the face of the retention module bracket (A in Figure 5), wrap your right index finger around the tab (B in Figure 5) protruding from the right edge of the bracket.
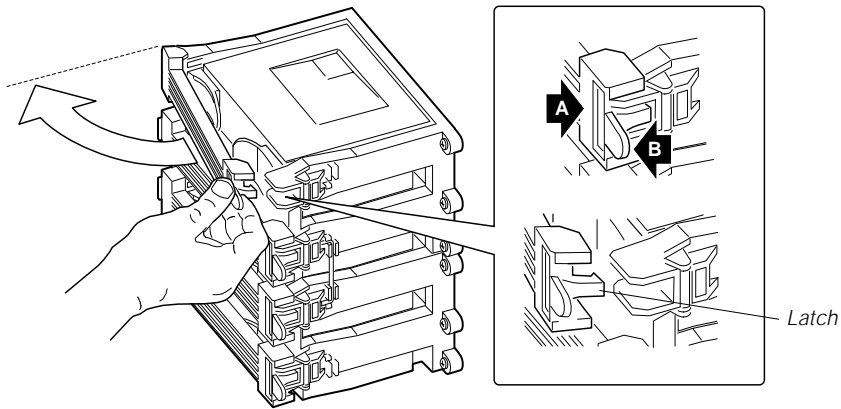
Figure 5: Releasing the Retention Module Bracket

5. Use your index finger to slightly pull the tab outward and to the left. You should not try to pull the entire bracket; rather, the back of the tab has a latch (C in Figure 5) that releases when the tab is pulled slightly.

6. When you have released the right edge of the bracket, rotate it 90° to the left until it is perpendicular to the front of the retention module. The left edge of the bracket has an open hinge that can release from the module when you rotate the bracket to the left.

7. Disengage the open hinge by moving (not rotating) the entire bracket to the right. Remove the bracket and set it aside.

8. Pull the two tabs attached to the single edge contact (SEC) cartridge (visible after you remove the bracket—C in Figure 6) straight away from the system board. As you do, the cartridge disengages from the connector on the system board.

Tab on SEC cartridge

Retention module guide rails

SEC cartridge

Retention module guide rails

Tab on SEC cartridge

Processor heat sink
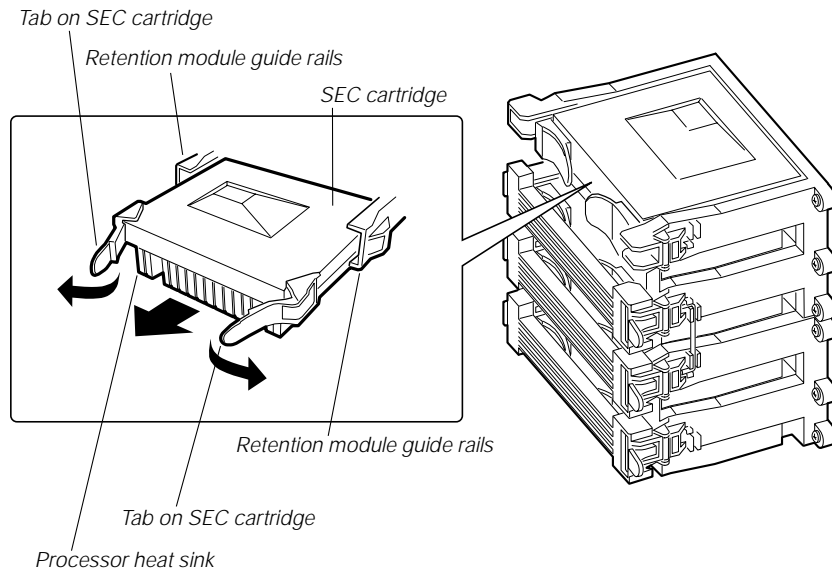
Figure 6: Removing a Processor

9. Slide the SEC cartridge straight away from the system board, out of the retention module. Put it on a piece of conductive foam and store it in an antistatic package.

10. Remove the replacement processor cartridge from its protective wrapping.

11. Orient the SEC cartridge so that the heat sink faces away from the center of the system board.

   If you are installing a termination card assembly, orient it so that the side with the label faces toward the center of the system board.

12. With the tabs at the top of the SEC cartridge completely open (pulled outward, away from the center of the cartridge—C in Figure 7), slide the cartridge into the guide rails of the retention module (B in Figure 7). When done properly, the triangular ends of the tabs (with two round pegs on each) fit into the entrance to the guide rails.
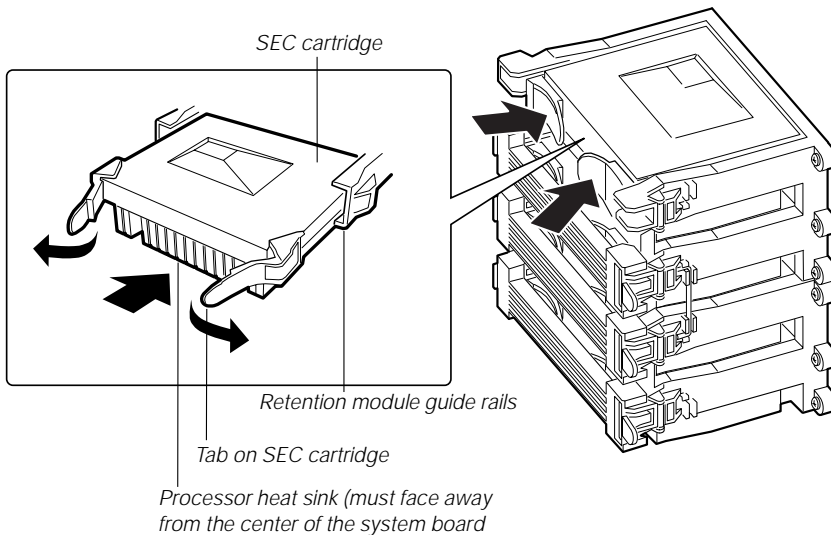
Figure 7: Installing a Processor

13. When the cartridge meets resistance, push the two tabs toward each other (E in Figure 7) until the processor is fully seated.

14. Reattach the retention module bracket:

   a. With the bracket in an open position (perpendicular to the front of the retention module), slide the open hinge at the left of the bracket into its receptacle at the left of the retention module.

   b. Rotate the bracket to the right until it reaches the retention module. With your right thumb on the face of the bracket and your right index finger around the tab at the right of the bracket, slightly pull the tab outward and to the left to open the latch at the back of the tab.

   c. As you open the latch on the back of the tab, slide the right edge of the bracket onto the retention module and release the tab. If done correctly, the bracket will latch securely.

15. Reinstall the foam cover.

16. Close the case, as described in "Closing the System" on page 7.

17. Reconnect the power cord and turn on the system.

Installing Another Processor

The system is compatible with Intel Pentium® II Xeon™ processors. You can either upgrade the existing processor or install another processor of the same speed as the original processor.

When adding a processor, order a Pentium II Xeon processor upgrade kit. The kit includes the Pentium II Xeon processor, a heat sink, and latches.

It is critical that a heat sink be installed on each processor. The Pentium II Xeon processor overheats and fails if it is not cooled sufficiently. The heat sink provided with the processor in the system provides all necessary cooling for the processor.

For the latest details on the availability of the upgrade kits, contact one of the sources listed in the *Assistance Resources* document.

To Install a Second Processor

1. Turn off the system and disconnect the power cord.

2. Open the case, observing the static electricity precautions in "Static Electricity Precautions" on page 2 and remove the foam cover on the electronics bay.

3. Wear an anti-static wristband grounded to the system chassis and place processors on a grounded, static-free surface or conductive foam pad.

4. Remove the termination card in the lowest numbered empty processor slot. (Processor slots are numbered from the bottom up or from the edge of the system board toward the center of the board.) With your

right thumb on the face of the retention module bracket (A in Figure 8), wrap your right index finger around the tab (B in Figure 8) protruding from the right edge of the bracket.
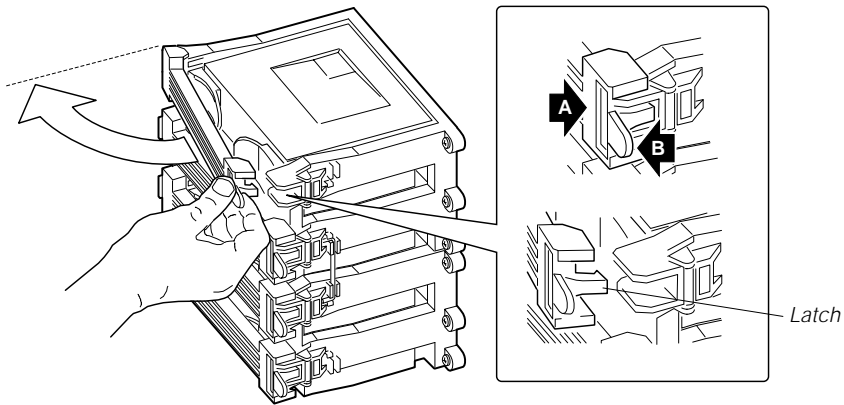
Figure 8: Releasing the Retention Module Bracket

5. Use your index finger to slightly pull the tab outward and to the left. You should not try to pull the entire bracket; rather, the back of the tab has a latch that releases when the tab is pulled slightly.

6. When you have released the right edge of the bracket, rotate it 90° to the left until it is perpendicular to the front of the retention module. The left edge of the bracket has an open hinge that can release from the module when you rotate the bracket to the left.

7. Disengage the open hinge by moving (not rotating) the entire bracket to the right. Remove the bracket and set it aside.

8. Pull the two tabs attached to the termination module (visible after you remove the bracket—C in Figure 9) straight away from the system board. As you do, the termination module disengages from the connector on the system board.

Tab on retention module

Retention module guide rail

Termination module

Retention module guide rail

Tab on retention module
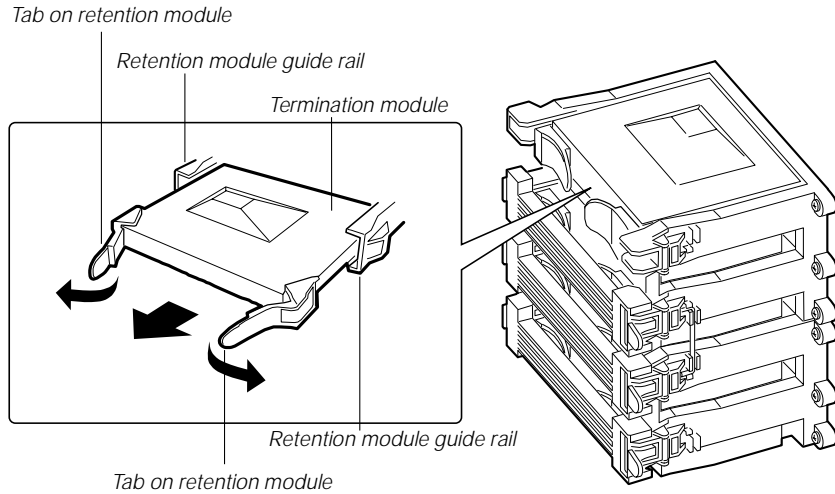
Figure 9: Removing the Termination Module

9. Slide the termination module straight away from the system board, out of the retention module. Put it on a piece of conductive foam and store it in an antistatic package.

10. Remove the processor cartridge from its protective wrapping.

11. Orient the S.E.C. cartridge so that the heat sink faces away from the center of the system board.

12. With the tabs at the top of the S.E.C. cartridge completely open (pulled outward, away from the center of the cartridge, Figure 10), slide the cartridge into the guide rails of the retention module (Figure 10). When done properly, the triangular ends of the tabs (with two round pegs on each) fit into the entrance to the guide rails.

SEC cartridge

Retention module guide rail

Tab on SEC cartridge

Processor heat sink (must face
away from the system board)
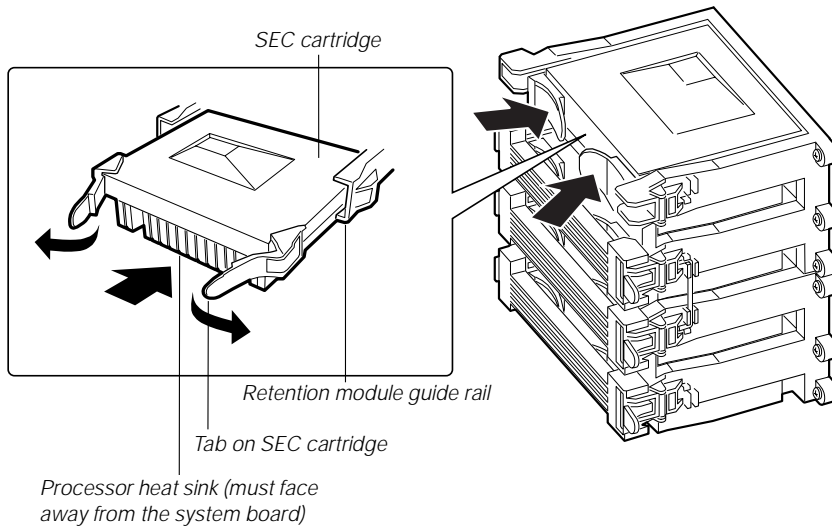
Figure 10: Installing a Processor

13. When the cartridge meets resistance, push the two tabs toward each
    other (Figure 10) until the processor is fully seated.

14. Reattach the retention module bracket:

    a. With the bracket in an open position (perpendicular to the front of
       the retention module), slide the open hinge at the left of the bracket
       into its receptacle at the left of the retention module.

    b. Rotate the bracket to the right until it reaches the retention module.
       With your right thumb on the face of the bracket and your right index
       finger around the tab at the right of the bracket, slightly pull the tab
       outward and to the left to open the latch at the back of the tab.

    c. As you open the latch on the back of the tab, slide the right edge of
       the bracket onto the retention module and release the tab. If done
       correctly, the bracket will latch securely.

15. Reinstall the foam cover.

16. Close the case, as described in "Closing the System" on page 7.

17. Reconnect the power cord and turn on the system.

● *Note:*

The foam cover is required
to control airflow past the
processors for proper
cooling. Failure to install the
foam cover could result in
damage to the processors
and other system
components.

Installing Hardware

The server includes expandability features that allow you to add several types of hardware to the interior of the system. All of the procedures given in this section use the ESD precautions identified in "Static Electricity Precautions" on page 2. All of the procedures in this section refer to Chapter 2, "Installing Components".

Memory

Main memory resides on an add-in board, called a memory module. The memory module contains slots for 16 DIMMs, each of which must be at least 32 MB, and is attached to the system board through a 242-pin connector. Memory amounts from 128 MB to 4 GB of DRAM are supported, with a 64/72-bit four-way-interleaved pathway to main memory. The 16 slots are divided into four banks of four slots each, labeled A through D. These banks support 4:1 interleaving. The memory controller supports EDO DIMMs only. The ECC used for the memory module is capable of correcting single-bit errors (SBEs) and detecting 100 percent of double-bit errors over one code word. Nibble error detection is also provided.
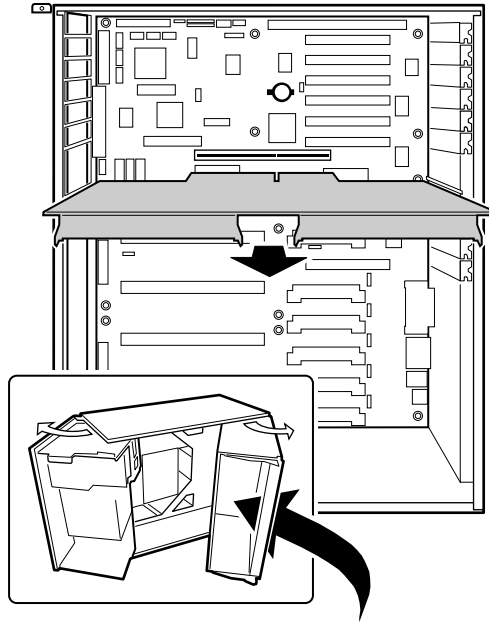
Removing the Memory Module

The memory module must be removed before you can change the memory configuration. See "Memory" on page 23 for memory size and requirements.

To Remove the Memory Module

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Remove the access cover (see "Opening the System" on page 3).

3. Remove the foam cover over the electronics bay.

4. Remove the memory module from the system board by pulling it gently from the electronics bay (see Figure 11). It is not necessary to open the electronics bay to remove the memory module.

Figure 11: Removing the Memory Module

5. Place the module component-side up on a nonconductive, static-free surface.

Removing DIMMs

When adding and removing DIMMs, remember that DIMMs must be installed or removed by banks. Each bank consists of four DIMM sockets. All DIMMs in the bank must be installed and all must be of the same size and speed. See Figure 4 on page 23 for the location of the DIMM sockets in each bank.

To Remove DIMMs

1. Observe the safety and ESD precautions in "Static Electricity
   Precautions" on page 2.

2. Remove the memory module and place it component-side up on a
   nonconductive, static-free surface (see "Removing the Memory
   Module" on page 40).

3. Gently push the plastic ejector levers out and down to eject a DIMM
   from its socket.

4. Hold the DIMM only by its edges, being careful not to touch its
   components or gold edge connectors. Carefully lift it away from the
   socket and store it in an antistatic package.

5. Repeat steps 3 and 4 to remove other DIMMs as necessary.

   If you are replacing DIMMs, proceed to "Installing DIMMs" on
   page 43. If you are removing DIMMs, continue this procedure.

6. Reinstall the memory module (see "Installing the Memory Module"
   on page 44).

7. Reinstall the foam cover.

8. Reinstall the access cover using the original screws.

9. Connect all external cables and power cords to the system.

10. Turn on the monitor and then the system.

11. Run the SSU/BIOS Setup (see "Advanced Chipset Control Submenu"
    on page 91 and "Resource Configuration Add-in Window" on
    page 112) to configure the system and to properly set up advanced
    memory attributes as required.

Installing DIMMs

When adding and removing DIMMs, remember that DIMMs must be installed or removed by banks. Each bank consists of four DIMM sockets. All DIMMs in the bank must be installed and all must be of the same size and speed. See Figure 4 on page 23 for the location of the DIMM sockets in each bank.

To Install DIMMs

1. Holding the DIMM only by its edges, remove it from its antistatic package.

2. Orient the DIMM so that the two notches in the bottom edge of the DIMM align with the keyed socket on the memory module.

3. Insert the bottom edge of the DIMM into the socket, then press down firmly on the DIMM until it seats correctly (see Figure 12).
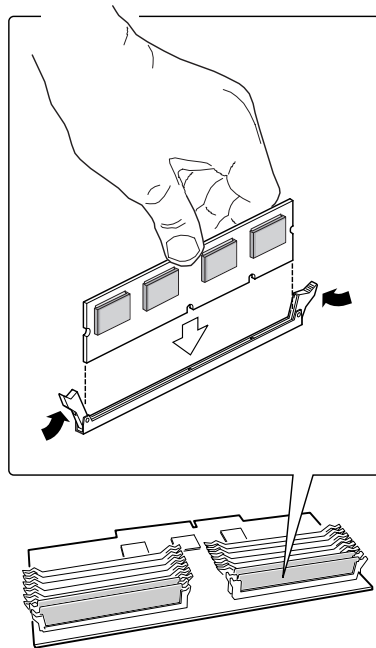
▼ *Caution!*

Use extreme care when installing a DIMM. Applying too much pressure can damage the socket. DIMMs are keyed and can be inserted in only one way.

Mixing dissimilar metals might cause memory failures later, resulting in data corruption. Install DIMMs with gold-plated edge connectors only in gold-plated sockets.

Figure 12: Installing a DIMM

4. Push the ejector levers on the socket ends to the upright position.

5. Repeat steps two through four to install each DIMM.

6. Reinstall the memory module (see "Installing the Memory Module" on page 44).

7. Reinstall the foam cover(s).

8. Reinstall the access cover using the original screws.

9. Connect all external cables and the power cords to the system.

10. Turn on the monitor and then the system.

11. Run the SSU (see "Resource Configuration Add-in Window" on page 112) to configure the system and to properly attribute ECC memory.

Installing the Memory Module

Once you have installed any DIMMs that you want, you must re-install the memory module.

To Install the Memory Module

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Holding the memory module by its edges, align the module so its edge engages in the guide rail at the back of the electronics bay.

3. Push the memory module toward the system board until it fully engages its connector.

4. Install the foam pad in the electronics bay.

5. Replace the system access cover and screws.

Drives

The case must be opened to add or replace drives (such as disk drives and CD-ROM drives) in the system. Refer to "Opening the System" on page 3, for instructions on opening and closing the case. While SCA-2 SCSI drives can be added or removed without opening the case, installing and removing these drives is discussed under "SCSI Hard Disk Drives" on page 54.
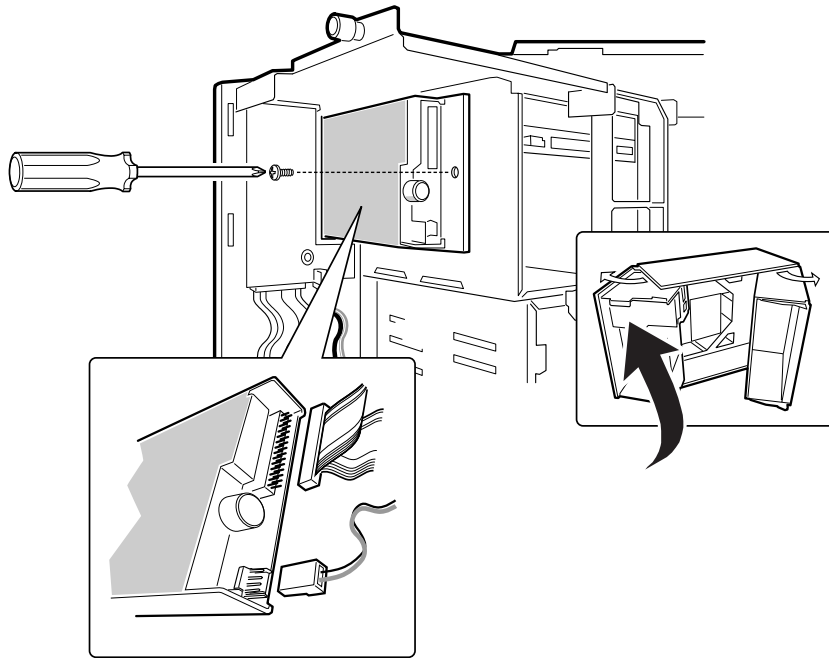
The Diskette Drive

The diskette drive is included in the original configuration. If you need to replace the diskette drive, follow the instructions below.

Removing the Diskette Drive

You should only replace the diskette drive if the originally installed drive fails.
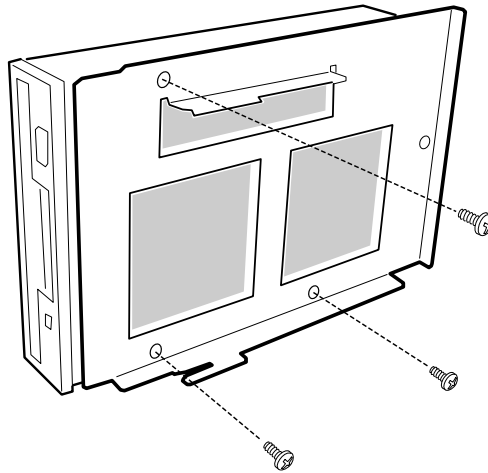
To Remove the Diskette Drive

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Remove the access cover (see "Opening the System" on page 3).

3. Remove the foam and fans from the subchassis. Be sure to label the fans and fan cables as you remove them.

4. Disconnect the power and signal cables (Figure 13) from the diskette drive. The connectors are keyed for ease in reconnecting them to the drive.

Figure 13: Removing the Diskette Drive

5. Remove and save the screw that secures the diskette drive carrier to the side of the 5.25-inch drive bay.

6. Slide the carrier toward the back of the chassis to disengage the tabs from the slots in the side of the 5.25-inch drive bay.

7. Remove the carrier/drive from the chassis and place it component-side up on an antistatic surface.

8. Remove the three screws that hold the carrier to the drive, and set them and the carrier aside. See Figure 14.

Figure 14: Removing the Diskette Drive Carrier

9. Place the drive in an antistatic protective wrapper if you are not reinstalling the same drive.

10. Reinstall the foam pads, fans (see "Installing an Individual System Fan" on page 62) and the access cover using the original screws.

Installing the Diskette Drive

You should only replace the diskette drive if the originally installed drive fails.

To Install the Diskette Drive

1. Remove the new 3.5-inch diskette drive from its protective wrapper, and place it component-side up on an antistatic surface.

2. Set any jumpers or switches according to the drive manufacturer's instructions.

3. Place the drive carrier on the component-side of the drive, and align the three mounting holes.

4. Attach the carrier to the drive with three screws of the appropriate size and length (reuse the screws you removed before). Tighten the screws firmly.

5. Position the carrier so that the two protruding notches fit into the corresponding slits in the side of the 5.25-inch drive bay. Slide the assembly toward the front of the system to engage the notches.

6. Make sure the front of the drive fits correctly in the front opening of the system. When properly positioned, the carrier notches extend slightly into the interior of the 5.25-inch drive bay and the threaded hole in the carrier aligns with the threaded hole in the frame.

7. Secure the assembly to the 5.25-inch bay with the screw you removed earlier; tighten the screw firmly.

8. Connect the signal and power cables to the drive. The red stripe on the signal cable must face toward the center of the drive.

9. Reinstall the foam pads, fans (see "Installing an Individual System Fan" on page 62) and the access cover using the original screws.

10. Run the SSU or BIOS Setup to specify that the diskette drive is installed in the system ("Modifying Resources" on page 114 or "Main Menu" on page 85).

Drive Cabling Considerations

Excluding the diskette drive, there are two types of devices that can be installed in the server; IDE devices and SCSI devices. This section covers cabling consideration for both types of devices. These cable considerations apply to any devices using the IDE or narrow SCSI controllers.

The number of devices you can install depends on:

•   The number supported by the bus
•   The number of physical drive bays available
•   The combination of SCSI and IDE devices

IDE Requirements

An 18-inch long IDE cable that supports two drives is standard in the system. If you install an IDE hard drive, we recommend placing it in the lowest internal drive bay to make cabling easier, particularly if you also have an IDE device in the 5.25-inch drive bay.

For proper IDE operation, note the cable length specified in Figure 15. If no drives are present on an IDE channel, the cable must be removed. If only one drive is installed, it must be connected at the end of the cable.
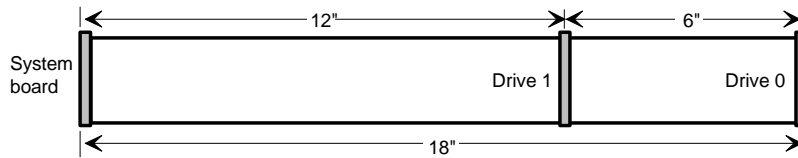
Figure 15: IDE Cable Dimensions

SCSI Requirements

One wide SCSI cable is standard in the system, connecting the system board to the SCSI backplane.

Terminate only the peripheral at the end of the SCSI cable. Hard drives usually provide active termination, while SCSI CD-ROM drives do not. Because we recommend putting hard drives only in the internal bays, you should route the SCSI cable so that the last device on it is a hard drive in the internal bay. The SCSI backplane in thew internal SCSI drive bay provides active termination for the SCSI drives connected to the backplane.

In general, install legacy devices in the 5.25-inch drive bay and connect them to the narrow SCSI cable. Ultra and Ultra-2 devices are normally hard drives connect them to the SCSI backplane at the rear of the SCSI drive bay. The wide SCSI connectors support either single-ended (SE) or low voltage differential (LVD) drives.

Installing a 5.25-inch Peripheral in the Front Bay

Three 5.25-inch half-height bays provide space for tape backup, CD-ROM, or other removable media drives.

Either type of device (IDE or SCSI) can be installed in the 5.25-inch peripheral bays. The system board only provides a single IDE cable and therefore only supports two IDE devices. The single narrow SCSI connector on the system board supports up to seven devices. The last device on the SCSI bus must be terminated.

To Install a 5.25-inch Device

1. Observe the safety and ESD precautions in"Static Electricity Precautions" on page 2. Also see the cabling considerations in "Drive Cabling Considerations" on page 48.

2. Open the front door by rotating its right side out and to the left.

3. Remove the access cover, see "Opening the System" on page 3.

4. Push the tab (A in Figure 16) on the left side of the EMI metal shield to the right to disengage it from the chassis. Removeand save the shield.
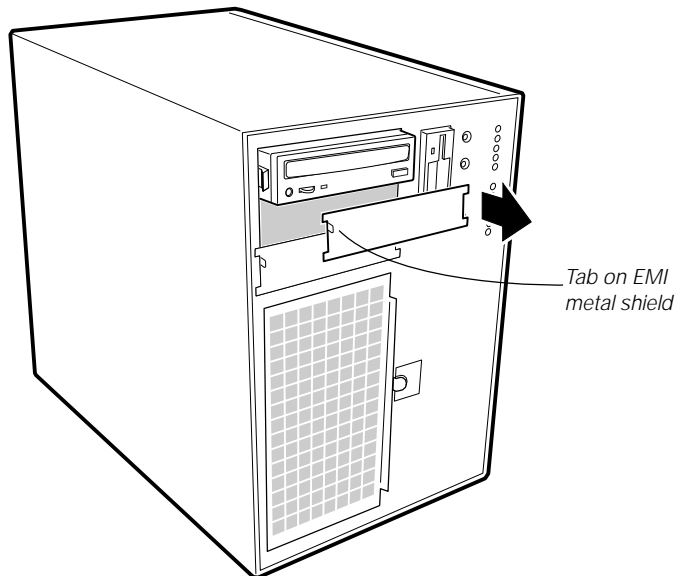
Tab on EMI metal shield

Figure 16: Removing the EMI Shield

5. Open the subchassis (see "Opening the Subchassis and Electronics Bay" on page 5) to gain access to the back of the 5.25-inch drive bay.

6. Remove the drive from its protective wrapper, and place it on an antistatic surface.

7. Set any jumpers or switches on the drive according to the drive manufacturer's instructions.

8. Using two screws of the appropriate size and length (not supplied), attach each plastic slide rail (see Figure 17) with its metal grounding plate to the drive.
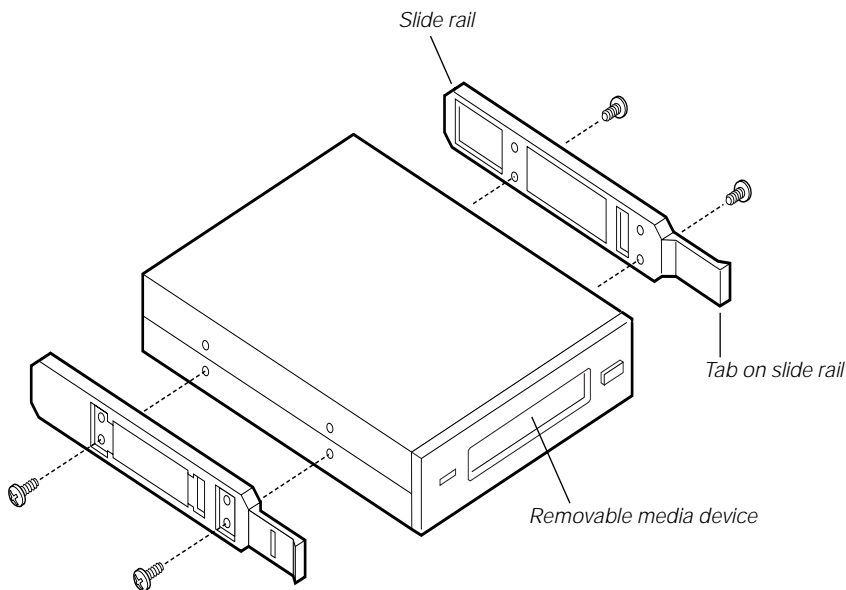
Figure 17: Attaching the Slide Rails

9. Position the drive so the plastic slide rails engage in the bay guide rails. Push the drive into the bay until the slide rails lock in place.

10. Connect a power cable to the drive. The connectors are keyed and can be inserted in only one way.

11. Connect a signal cable to the drive.

- **SCSI drive:** Attach connectors on the cable to the SCSI device or devices you are installing.
- **IDE drive:** The system board has one IDE connector. It can support an IDE signal cable up to 18 inches long. See Figure 15 on page 49 for the cable dimensions.

12. If the drive requires any other cables, connect them.

13. Close the subchassis and make sure the foam cover is properly installed, being careful not to pinch any wires or cables (see "Closing the Subchassis and Electronics Bay" on page 7).

14. Replace the access cover, see "Closing the System" on page 7.

15. Close the front door.

If you remove a device from the 5.25-inch drive bay and do not replace it with another 5.25-inch device of the same height, replace the EMI shield(s) in the drive bay to maintain the EMI and airflow characteristics of the chassis.

To Remove a 5.25-inch Device

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Open the front door by rotating its right side out and to the left.

3. Remove the access panel, see "Opening the System" on page 3.

4. Open the subchassis (see "Opening the Subchassis and Electronics Bay" on page 5) to gain access to the back of the 5.25-inch drive bay.

5. Disconnect the power and signal cables from the drive.

▼ *Caution!*

The internal narrow SCSI interface in this system supports only single-ended SCSI devices. Connecting differential SCSI drive types to this interface can result in electrical damage to the system board and peripherals.

6. The drive has two protruding plastic, snap-in rails attached. Squeeze the rail tabs toward each other as you carefully slide the drive forward out of the bay, and place it on an antistatic surface (Figure 18).

Tab on slide rail

Removable media device
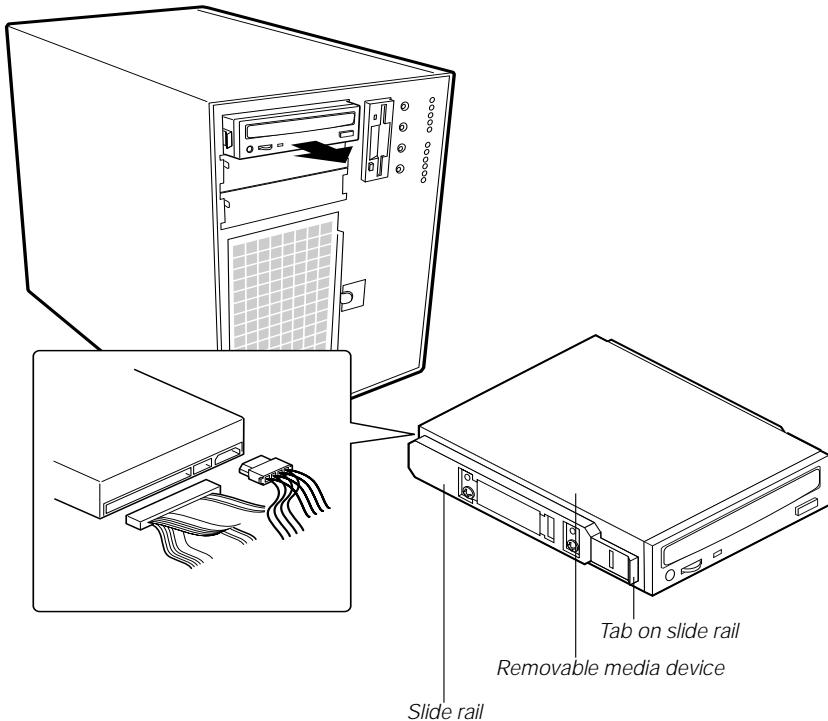
Slide rail

Figure 18: Removing a Removable Media Device

7. Remove and save the four screws and two slide rails.

8. If you do not replace the device with another 5.25-inch device, replace the EMI shields to maintain the EMI and airflow characteristics of the chassis.

   If the device is a SCSI device and it was installed at the end of the SCSI signal cable, modify the cable and termination arrangement so that a proper termination exists at the end of the cable (it can be a termination device only, not necessarily a SCSI peripheral).

9. Close the subchassis and make sure the foam cover is properly installed, being careful not to pinch any wires or cables (see "Closing the Subchassis and Electronics Bay" on page 7).

10. Replace the access panel, see "Closing the System" on page 7.

11. Close the front door.

SCSI Hard Disk Drives

The system supports a variety of SCSI devices. As shipped from the supplier, the system might contain no hard disk drives. Contact your sales representative or dealer for a list of approved SCSI devices. If you install 10,000 rpm SCSI hard drives, you must install heat sinks on the drives and additional fans in the chassis. See the sections below for specific instructions.

Installing Heatsinks on High-Power Drives

If you plan to use SCSI drives whose power exceeds 15 watts, you must install heatsinks on those drives.

▼ *Caution!*

If you install high-power drives, you must also install additional system fans. See "Installing Fans for High-Power Drives" on page 57.

To Install Heatsinks on Hard Drives

1. Position each heatsink (Figure 19) so that the three screw holes in the heatsink align with the corresponding holes in the hard drive. The holes are placed so that you can position the heatsink in only one way: with the fins extending along the side and the top of the hard drive.
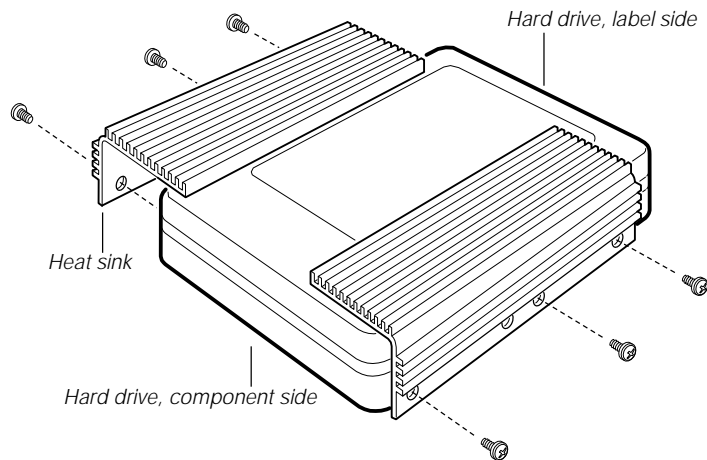

Figure 19: Installing Heatsinks on a Hard Drive

2. Use three screws (D) to attach each heatsink to the drive.

3. To insert the drive into the hot-docking bay, you must attach a carrier to the drive. See "Mounting a SCSI Hard Disk Drive in a Carrier" on page 55.

Mounting a SCSI Hard Disk Drive in a Carrier

Before you can install an LVD SCA-2 SCSI hard drive in the system, you must mount it on a drive carrier to allow easy installation into the server.

To Mount a SCSI Drive on a Carrier

1. Remove the 3.5-inch hard drive from its wrapper and place it on an antistatic surface.

2. Orient the drive so the connector is near the top surface of the drive, then place the carrier on top of the drive.

3. Using four screws of the correct size and length (not supplied), attach the carrier to the drive (see Figure 20).
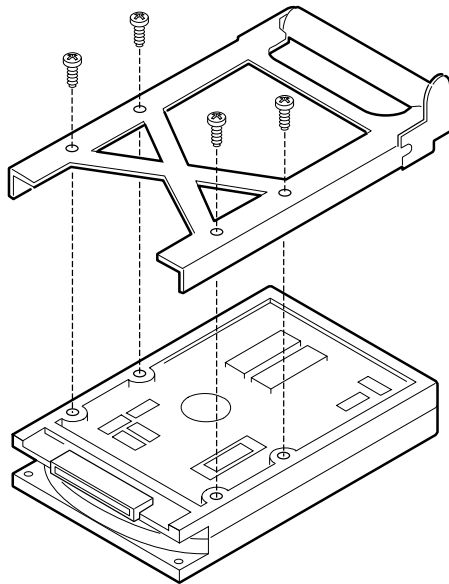
● *Note:*

Faster drives, those operating at or above 10,000 RPM, require the use of aluminum drive carriers to improve heat dissipation. Do not mount these drives on plastic carriers.

Figure 20: Hard Disk Drive and Carrier

Hot-swapping a SCSI Drive

A bank of six yellow LEDs on the front panel monitors the drive status of each drive in the hot-docking bay. Each LED corresponds directly to a drive, so that the upper-most LED reflects an error condition in the upper-most drive. The six LEDs and corresponding drives are numbered (top to bottom) zero through five. When a yellow LED is on continuously, it is okay to hot-swap (replace) a bad drive with a good one. You do not need to shut the system down to hot-swap a drive.

To Hot-swap a SCSI Drive

1. Open the front system door by rotating its right side out and to the left.

2. If you installed a padlock on the metal door to the SCSI drive bay, unlock the padlock and remove it.

3. Press the plastic latch securing the metal door to the SCSI drive cage, and open the door.

4. Check the bank of yellow LEDs on the front panel to determine which drive is bad.

5. Press the rounded tab on the right of the carrier to the left (toward the center of the drive, Figure 21) while gently pulling straight down on the carrier handle (Figure 21). This disengages the latch that secures the carrier to the chassis.
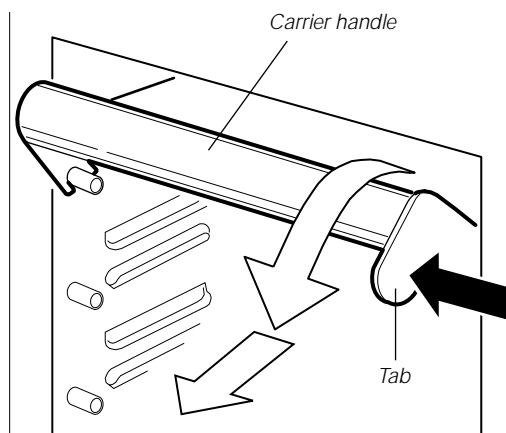
Figure 21: Disengaging Drive Carrier from Chassis

6. Grasp the plastic carrier handle and pull it toward you to disengage the drive connector from the backplane connector.

7. Carefully slide the bad drive forward out of the bay. Place the drive on an antistatic surface.

8. Position the new plastic carrier and drive assembly so that it engages the bay guide rails.

9. Push the drive into the bay. To engage the latch, the carrier handle should be approximately at a 45° angle from the vertical front of the chassis. As you push the drive into the bay, the two rounded notches in the carrier handle (Figure 22) slide onto the two round pegs inside the drive bay . When they engage, push the handle straight up to lock the notches onto the pegs and press the rounded tab on the right of the carrier to the left until it clears the edge of the bay and snaps into place.
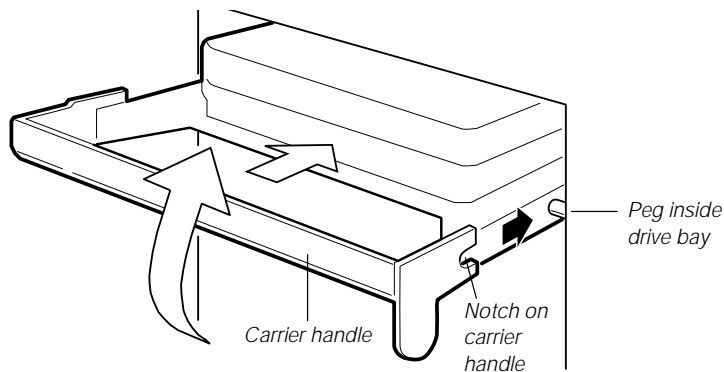
Figure 22: Installing a New Drive

10. Close the metal door, and secure it to the chassis with the plastic latch.

11. For security and to prevent unauthorized access to the bays, insert a padlock through the metal loop protruding through the door.

12. Close the front system door.

Installing Fans for High-Power Drives

If the SCSI drives you use have a power rating in excess of 15 watts, install three additional system fans: two in the front fan bay and one in the upper power supply bay. Purchase the additional fans through normal channels.

Installing a Fan in the Power Supply Bay

This procedure describes installation of a fan in the third power supply module bay. This procedure is only valid for configurations using two power supply modules.

To Install a Fan In the Power Supply Bay

1. Remove four screws, the grill plate, and fan from your kit.

2. Remove the plate (Figure 23) that covers the power supply bay closest to the PCI slots. It is the uppermost bay when the server is standing upright in pedestal mode.
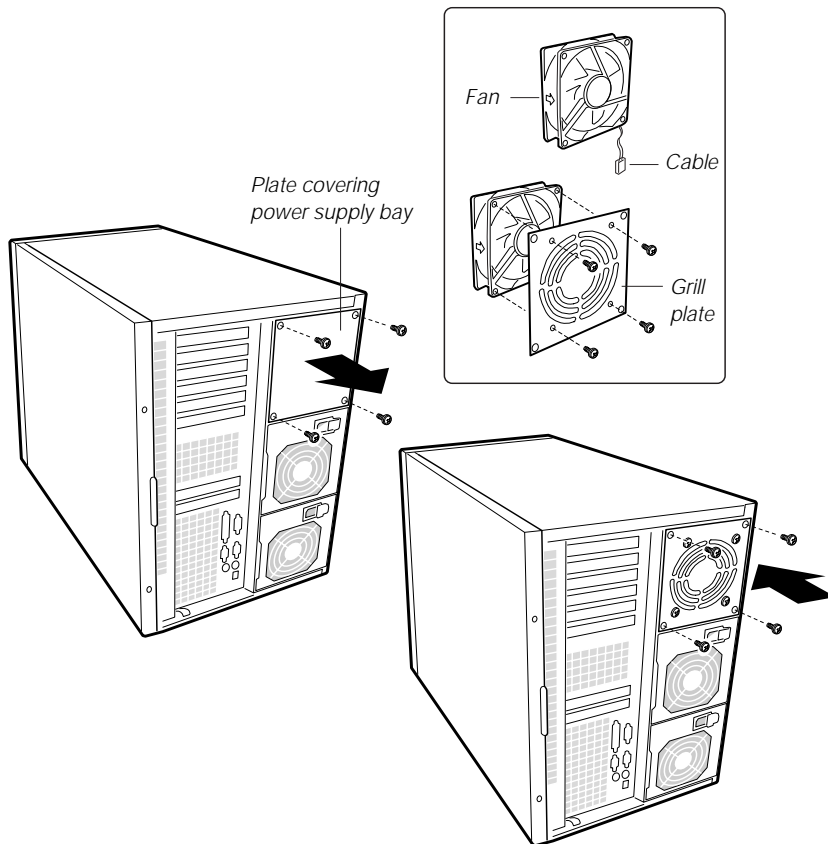

Figure 23: Installing a Fan in the Power Supply Bay

3. Using four screws, attach the fan to the grill plate (Figure 23) so that the fan label faces the plate.

4. Insert the fan/grill plate assembly into the power supply bay so that the cable points downward (Figure 23) from the fan toward the other two power supplies, and so the fan's label faces out the back of the chassis. This alignment is important to ensure correct airflow direction.

5. Using four screws, attach the fan/grill plate assembly to the chassis (Figure 23).

Removing an Individual System Fan

The subchassis houses up to eight system fans. Not all of these fans are required in standard configurations. If a fan fails, follow this procedure to remove the failed fan.

To Remove an Individual System Fan

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Remove the access cover (see "Removing the Access Cover" on page 3).

● *Note:*

Correct airflow direction: The side of each fan is embossed with directional arrows indicating airflow direction. Always note the direction of the arrows on a fan before removing it. You will need this information later when you install a different fan.

3. Remove the foam cover from the front subchassis by pulling it straight out (see Figure 24). Be careful not to break the foam.
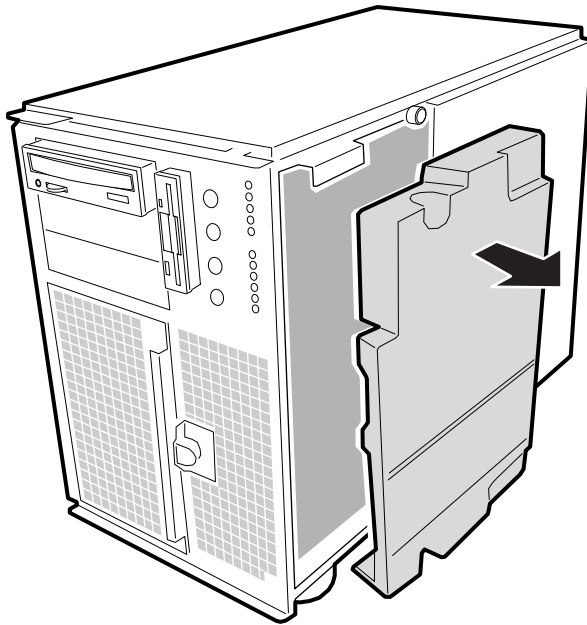

Figure 24: Removing the System Fan Assembly

4. For better access to the individual fan cables on the front panel board, carefully rotate the right edge of the foam fan assembly outward into the opening where the foam cover was.

5. Label and disconnect the desired fan cable from the front panel board. Be sure to note the position of the cable where it is held in place in the foam fan assembly (see Figure 25).
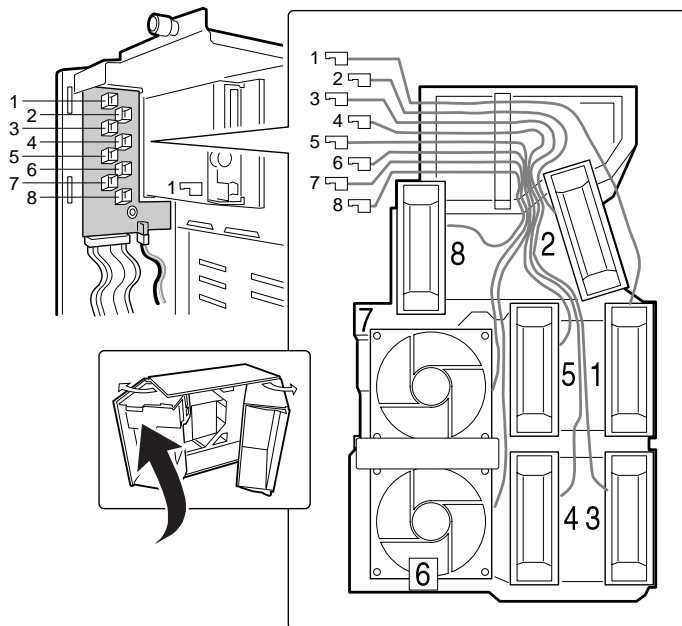
Figure 25: Fan Cabling

6. Remove the fan cable from the foam assembly, being careful not to break the foam.

7. Remove the fan from the foam assembly. All systems fans sit differently in the assembly, but in general, each fan can slide in and out of the foam in only one way.

● *Note:*

The two installed fans nearest the 5.25-inch drive bays (fans 6 and 7 in Figure 25) are separated by a square piece of foam (the piece with a crescent-shaped hole) that extends perpendicularly from the front of the fans (in Figure 25, it is the rectangle between the round faces of fans 6 and 7). You must remove this piece to access the two fans it separates (pull it straight out).

Installing an Individual System Fan

The subchassis houses up to eight system fans. Not all of these fans are required in standard configurations. If you use high power hard drives, you must install additional fans. Follow this procedure to install additional fans.

To Install an Individual System Fan

1. See "Removing an Individual System Fan" on page 59, as necessary.

2. Observe the safety and ESD precautions at the beginning this chapter.

3. Slide the fan into its correct receptacle in the foam fan assembly.

4. Attach the cable to the foam at the correct places (if you are replacing a bad fan, you should have recorded where each cable attaches to the foam; if you are adding a fan, see Figure 25 on page 61).

5. Position the fan assembly inside the chassis so that the individual fan cables can easily reach their connectors on the front panel board.

6. Attach the cable to the front panel at the correct connector.

7. Position the fan assembly as it was inside the chassis prior to removal, so that it rests firmly against the diskette drive at the top and the 5.25-inch bays at the middle and bottom.

8. Reinstall the foam cover. It is molded to match the position of the fans and fits in only one way.

9. Reinstall the access cover using the original screws.

Expansion Cards

The system board has seven slots for the installation of expansion cards. There are six PCI slots and one shared slot that can support either a PCI card or an ISA card.

Installing an Expansion Card

Expansion cards can be extremely sensitive to ESD and require careful handling. After removing the card from its protective wrapper or from the system board, place it component-side up on a grounded, static-free surface or conductive foam pad. Do not slide the card over any surface.

To Install an Expansion Card

1. Remove the access panel (see "Removing the Access Cover" on page 3).

2. Remove the expansion card from its protective wrapper. Be careful not to touch the components or the gold edge connectors.

3. Set any jumpers or switches according to the manufacturer's instructions.

4. Remove the rear foam pad from the electronics bay.

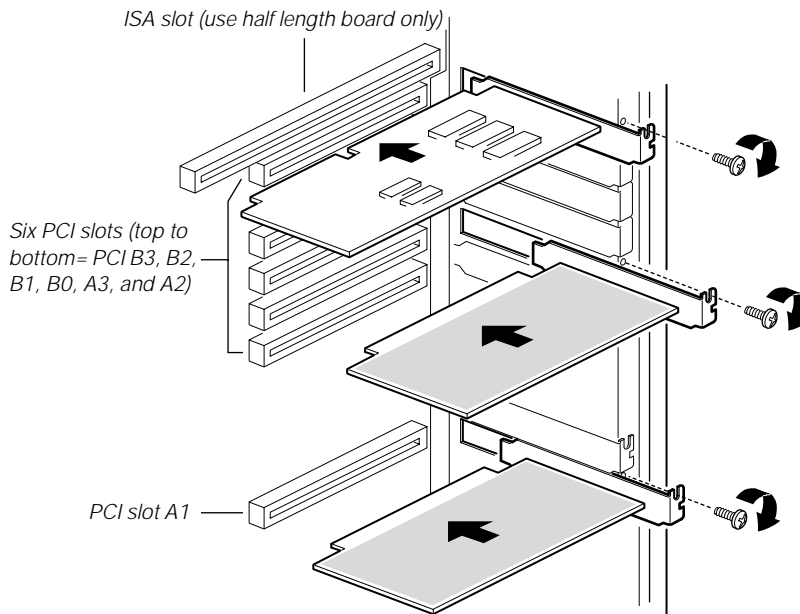5. Remove and save the expansion slot cover (Figure 26).

Figure 26: Installing an Expansion Card

6. Hold the expansion card by its top edge or upper corners. Firmly press it into an expansion slot on the system board. The tapered foot of the board retaining bracket must fit into the mating slot in the expansion slot frame.

   a. Install an ISA board component-side up.

   b. Install a PCI board component-side down.

7. Replace the screw you removed when you removed the slot cover to secure the card in the slot.

8. Attach cables to the card if necessary.

9. Replace the rear foam pad.

10. Reinstall the access panel using the original screws (see "Installing the Access Cover" on page 8).

11. Running the SSU is optional after you install or remove a PCI or ISA board.

Removing an Expansion Card

Remember that removing an ISA expansion card may require you to use the SSU to remove it from the system configuration.

To Remove an Expansion Card

1. Observe the safety and ESD precautions in "Static Electricity Precautions" on page 2.

2. Remove the access cover ("Opening the System" on page 3), and the rear foam pad.

3. Disconnect any cables attached to the board you are removing.

4. Remove and save the screw that secures the board in its slot.

5. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.

6. Store the board in an antistatic protective wrapper.

7. If you are not reinstalling a board in the same slot, install a slot cover over the vacant slot. The tapered foot of the cover must fit into the mating slot in the expansion slot frame.

8. Replace the rear foam pad and the access panel ("Closing the System" on page 7).

9. Running the SSU is optional after you install or remove a PCI or ISA board.

Power Supplies

The system can be configured with two or three power supply modules. These configurations use a power share board that distributes the power supplied by two supply modules to various system components. Table 5 shows the power distribution using the power share board. Configurations using three power supply modules use the same power share board as those using two supply modules. The third module acts as a hot spare and allows hot swapping of failed power supply modules.

Table 5: Power Sharing

Power Supply	Output
B	System board 5V
A	System board 3.3V
A	System board 12v-1
B	System board 12V-2
A	Peripheral 5V
B	Peripheral 12V

⚠ *Warning!*

Hazardous voltage, current, and energy levels are present inside the power supply. There are no user-serviceable parts inside it; servicing must be done by technically qualified personnel.

Removing a Power Supply Module

If the system configuration includes three power supply modules, hot-swapping is possible; allowing you to remove a power supply module without powering down the system. If your configuration uses only two modules, you must power down the system before removing or replacing the failed power supply module.

1. Disconnect the AC power cables from the power supply modules. You must hold the power supply retention clip to the side as you remove the power cord (see Figure 27 on page 66).

2. Remove the four screws (Figure 27) holding the power supply module to the back of the chassis.

3. Using the flared, vertical edges as handles and using both hands, slide the power supply module straight back from its bay (Figure 27).
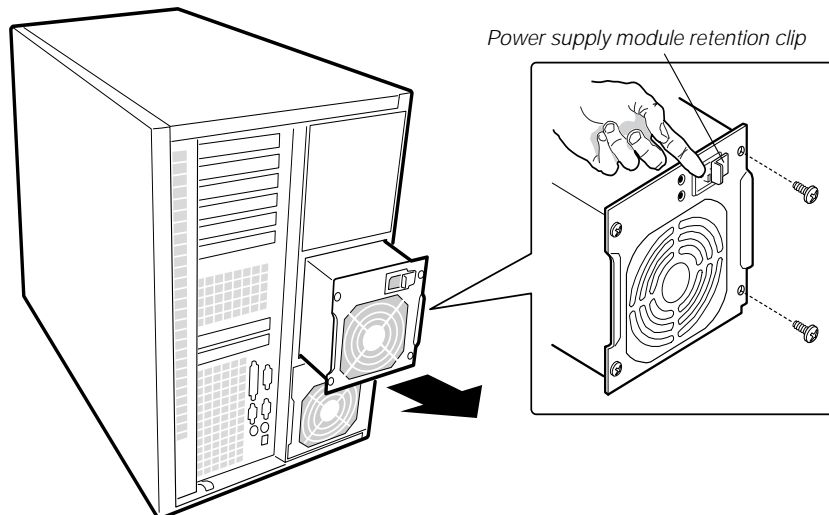
▼ *Caution!*

You might feel initial resistance in sliding the power supply from its bay. Do not tilt or twist the supply. Resistance is caused by the supply disengaging from its 40-pin connector. Use even, steady force to remove the supply.

Power supply module retention clip

Figure 27: Removing a Power Supply Module

Installing a Power Supply Module

The power share board allows you to use two power supply modules or to use two modules and install a third module as a hot backup. If you install the third module, you can perform hot-swapping if a module fails.

Installing a Power Supply Module

1. If you have not already powered down the system or if you are not hot-swapping the power supply module, power down the server.

2. If you are replacing a failed module, remove the failed module. See "Removing a Power Supply Module" on page 66.

3. If you are installing an additional power supply module, remove the access cover. If you are replacing a failed module, install the new module in the same bay from which you removed the failed module.

4. Slide the power supply into its bay.

5. With even force on the flared, vertical edges, push toward the front of the system until the edges rest against the rear of the chassis and the power supply module engages its connector.

6. Install and tighten the four screws holding the module to the back of the chassis.

7. Connect the AC power cable. You must slide the cover on the AC connector to access the connector itself (Figure 27 on page 66).
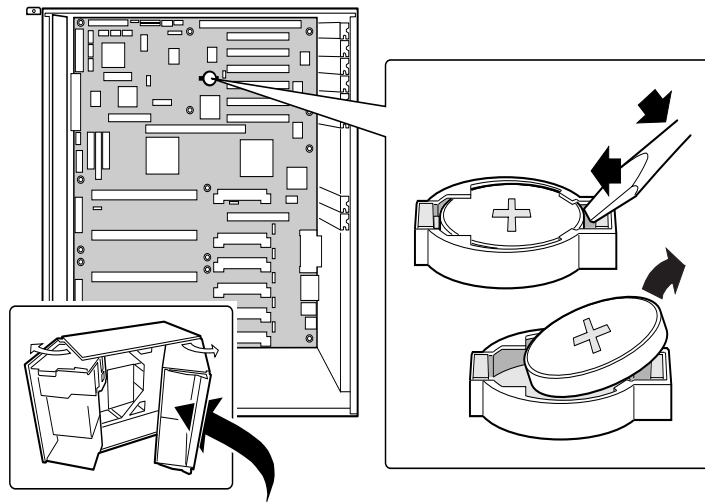
Replacing the Battery

The battery provides power for the system real-time clock and CMOS RAM, which holds the system configuration information.

To Replace the Battery

1. Restart the computer and start the BIOS Setup program by pressing F2 when you are prompted to do so.

2. Write down the CMOS values from BIOS Setup so you can reenter them after you replace the battery. For more information about the setup program, see "BIOS Setup" on page 79.

3. Turn off the system and disconnect the power cords.

4. Open the case, observing the static electricity precautions in "Static Electricity Precautions" on page 2.

5. Locate the battery on the system board, see Figure 3 on page 11. The battery is circular and has the positive pole mark (+) on the top.

6. Gently pull the battery from its socket. You may need to use a screwdriver with an insulated handle or other implement to remove the battery, see Figure 28.

Figure 28: Replacing the Battery

7. Press the new battery in the socket with the positive pole (+) up. Be sure you have pressed the battery down far enough for it to contact the base of the socket.

8. Close the case, as described in "Closing the System" on page 7.

9. Reconnect the power cord and turn on the system.

10. Enter the BIOS Setup program and verify that the system configuration is correct using the data you recorded in Step 2.

If the CMOS data is not correct, change the information in the setup screens as necessary.

Troubleshooting the Battery Installation

If you have problems after installing the new battery, try each of the items listed below, replacing the cover and restarting the computer after each try.

- Turn off the system and ensure that all exterior cables are attached to the correct connectors and secured.

- Check to be sure that all power switches are on. If the system is plugged into a power strip or surge protector, be sure it is turned on also.

- Enter the BIOS Setup program and compare the settings on the screen with your notes or the system hardware manuals. Correct any discrepancies.

- Turn off the system, remove the cover, and verify that all cables inside the case are attached securely. Also, make sure that the colored cable edges are aligned correctly and that the connectors did not miss any pins. Disconnect and reconnect the cables, and then replace the cover carefully so as not to disturb any cables.

- Turn off the system, remove the cover and, if you have the proper test equipment, verify that the new battery has power. (It is possible, although highly unlikely, that your new battery is defective.)

If these procedures fail to correct the problem, contact technical support.

4

Jumpers and Drivers

Contents

Setting the Jumpers

The system board jumpers let you change several system functions. Jumpers are set to the default positions at the factory. You may need to change the jumper settings to perform the following functions:

- Clear CMOS memory
- Clear the passwords from CMOS memory
- Recover from a failed BIOS update

One 11-pin connector provides three 3-pin jumper blocks that control the functions identified above. Figure 29 shows the location and orientation of the jumpers. Items in **bold** in Table 6 on page 73 show the default placement for each configurable option.
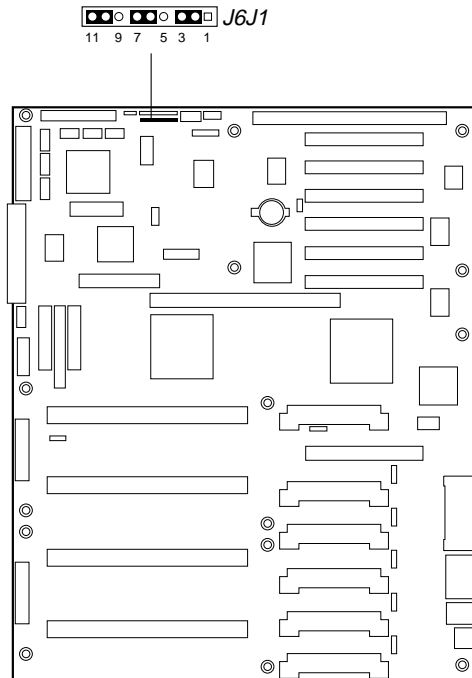
Figure 29: System Board Jumpers

Table 6: System Board Jumper Summary

Function	Pins	What it Does at System Reset
CMOS clear	1-2, Normal	Preserves the contents of the NVRAM
	2-3, Forced erase	Replaces the contents of the NVRAM with the manufacturing default settings
Password clear	5-6, Protect	Maintains the current passwords
	6-7, Erase	Clears the passwords
Recovery boot	9-10, Normal	System boots using the BIOS stored in flash memory
	10-11, Recovery	BIOS attempts a recovery boot, loading the BIOS code from a diskette into the flash device. Use this jumper when the BIOS code has been corrupted by a failed flash update.

Changing a Jumper Setting

The short general procedure for changing a configuration setting is the same for most of the jumper functions, so it is described here.

To Change a Jumper Setting

1. Observe the safety and ESD precautions at the beginning of "Static Electricity Precautions" on page 2.

2. Turn off all connected peripherals, turn off system power, and disconnect all AC power cords.

3. Remove the access cover.

4. Remove the foam insert from the electronics bay.

5. Locate the configuration jumpers at the edge of the system board toward the front of the system (see Figure 29 on page 72).

6. Move the jumper to the pins specified for the desired setting.

7. Reinstall the foam insert and the access cover using the original screws, connect the power cords, and turn on the system for the change to take effect.

8. You may need to repeat these steps to move the jumper back to its original setting, depending on the jumper function.

● *Note:*

You do not need to remove the system board from the chassis, and you probably do not need to remove any expansion cards.

CMOS Clear Jumper

The jumper at pins 1, 2, and 3 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset.

To Restore the Manufacturing Default CMOS Settings

1. See "Changing a Jumper Setting" on page 73.

2. Move the CMOS jumper from pins 1 and 2 to pins 2 and 3 (the Clear CMOS memory position).

3. Reinstall the access cover for your safety (using the original screws), and connect the power cords to the system.

4. Turn the system on. Wait for POST to complete and for the messages

   NVRAM cleared by jumper

   Press <F2> to enter Setup

   to appear. This automatically reprograms CMOS to its default settings, except for the password.

5. Enter Setup and make any changes necessary (for example, changing the boot device).

6. Press F10 to save the new Setup configuration and exit Setup.

7. Turn off the system, and disconnect all AC power cords from the system.

8. Again remove the access cover.

9. Move the jumper from pins 2 and 3 back to pins 1 and 2 (the Protect CMOS memory position).

10. Reinstall the access cover using the original screws, and connect the power cords to the system.

11. Run BIOS Setup or the SSU to verify the correct settings. See Chapter 5, *BIOS Setup* and Chapter 6, *The Server Setup Utility* for more information on setting BIOS and SSU fields.

Password Clear Jumper

The jumper at pins 5, 6, and 7 controls whether a stored password is retained or cleared during a system reset.

To Clear and Replace a Password Using the Jumper

1. See "Changing a Jumper Setting" on page 73.

2. Move the Password jumper from pins 5 and 6 to pins 6 and 7.

3. Reinstall the access cover for your safety (using the original screws), and connect the power cords to the system.

4. Turn the system on, and wait for POST to complete. This automatically clears the password.

5. Turn off the system, and disconnect all AC power cords.

6. Again remove the access cover.

7. Move the jumper from pins 6 and 7 back to pins 5 and 6.

8. Reinstall the access cover using the original screws, and connect the power cords to the system.

9. Run the SSU to specify a new password. See "Security Add-in" on page 116 for instructions on setting a password in the SSU.

Recovery Boot Jumper

The jumper at pins 9, 10, and 11 controls whether the system attempts to boot using the BIOS programmed in flash memory or if it attempts to flash the BIOS from a diskette in drive A. If an attempted BIOS update is interrupted, you may need to perform this procedure.

To Perform a Recovery Boot

1. See "Changing a Jumper Setting" on page 73.

2. Move the recovery boot jumper from pins 9 and 10 to pins 10 and 11.

3. Reinstall the access cover for your safety (using the original screws), then connect the power cords to the system.

4. Turn the system on, and insert the Flash Memory Update Utility diskette in drive A. After the system boots, the speaker emits a single beep and the recovery process starts. This takes about three minutes. When the recovery process completes, the speaker emits two beeps.

   While in recovery mode, there is no screen display on the monitor. The keyboard is also disabled as the system automatically recovers the BIOS. The beep codes listed in Table 7 describe the recovery status.

Table 7: Recovery Boot Beep Codes

Beep Codes	Message
2	Successful completion, no errors.
4	The system could not boot from the diskette. The diskette may not be bootable.
Continuous series of low beeps	The wrong BIOS recovery files are being used and/or the flash memory jumper is in the wrong position.

5. Turn the system off, disconnect all AC power cords from the system, and remove the access cover.

6. Move the jumper from pins 10 and 11 back to pins 9 and 10 to enable the normal boot mode.

7. Replace the foam pad and the access cover, remove the diskette from drive A, and connect the power cords to the system.

8. After running the special recovery mode, run the BIOS Setup or the SSU to specify a new password. See "Security Menu" on page 92 and "Security Add-in" on page 116 for information on setting passwords in BIOS Setup and the SSU.

Installing Software and Drivers

Installing software and drivers is usually specific to the operating system you run on the system. However, some tips on installing drivers or other software in critical situations or under particular circumstances are provided below.

Installing Video Drivers

After configuring the system, you need to install video drivers to take full advantage of the features of the onboard CL-GD5480 super VGA video controller.

- The software shipped with the server includes video drivers for use with Windows NT.

- For other operating systems, see the operating system instructions for installing device drivers.

BIOS Setup

Contents

Introduction

This chapter describes the BIOS Setup utility. The following chapters describe the power-on self test (POST) and other utilities for configuring and managing the server. These utilities are:

- POST: described in Chapter 7, "Other Utilities" on page 125. POST checks basic system integrity and all major components.

- Server Setup Utility (SSU): described in Chapter 6, "The Server Setup Utility" on page 103. Use for extended system configuration of onboard resources and expansion cards, viewing the system event log (SEL), setting boot device priority, or setting system security options.

  Run the SSU from a set DOS-bootable diskettes. See "What You Need to Do" on page 106 to make a set of SSU diskettes.

  Information entered via the SSU overrides information entered via Setup.

- Emergency Management Port (EMP) Console: described in Chapter 7, "Other Utilities" on page 125. Use the EMP to access and monitor the server remotely.

- FRUSDR Load Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the Field Replacement Unit (FRU), Sensor Data Record (SDR), and Desktop Management Interface (DMI) flash components.

- BIOS Update Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the BIOS or recover from a corrupted BIOS update.

- Firmware Update Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the BMC flash ROM.

- Symbios SCSI Utility: described in Chapter 7, "Other Utilities" on page 125. Use to configure or view the settings of the SCSI host adapters and onboard SCSI devices in the system.

If the system does not have a diskette drive, or the drive is disabled or misconfigured, use Setup to enable it. Or, you can move the CMOS jumper on the system board from the default setting (protect CMOS memory) to the clear setting; doing so allows most system configurations to boot. Then run BIOS Setup and the SSU to configure the system.

Using BIOS Setup

This section describes the BIOS Setup options. Use Setup to change the system configuration defaults. You can run Setup with or without an operating system present. Setup stores most of the configuration values in battery-backed CMOS; the rest of the values are stored in flash memory. The values take effect when you boot the system. POST uses these values to configure the hardware; if the values and the actual hardware do not agree, POST generates an error message. You must then run Setup to specify the correct configuration.

Run Setup: you can run Setup to modify any standard system board feature such as:

- Select the diskette drive
- Select the parallel port
- Select a serial port
- Set the time or date (to be stored in the real-time clock (RTC))
- Configure an IDE hard drive
- Specify the boot device sequence
- Enable the SCSI BIOS

Run SSU, not Setup: you must run the SSU instead of Setup to do the following:

- Enter or change information about an expansion card
- Alter system resources (e.g., interrupts, memory addresses, I/O assignments) to your choices instead of those selected by the BIOS resource manager

Record Your Setup Settings

It is a good idea to maintain a current record of the Setup and SSU settings for each system. If the default values ever need to be restored (after a CMOS clear, for example), you must run Setup again. Referring to your notes will make the task easier.

If You Cannot Access Setup

If the diskette drive is misconfigured so that you cannot access it to run a utility from a diskette, you might need to clear CMOS memory. You must open the system, change a jumper setting, use Setup to check and set diskette drive options, and change the jumper back. For a step-by-step procedure, see "CMOS Clear Jumper" on page 74.

Starting Setup

You can enter and start Setup under several conditions:

- When you turn on the system, after POST completes the memory test
- When you reboot the system by pressing CTRL+ALT+DEL while at the DOS operating system prompt
- When you have moved the CMOS jumper on the system board to the "Clear CMOS" position (enabled); for a step-by-step procedure, see "CMOS Clear Jumper" on page 74.

In the three conditions listed above, after rebooting, the system displays this prompt:

    Press <F2> to enter SETUP

In a fourth condition, when CMOS/NVRAM has been corrupted, the system displays other prompts but not the F2 prompt:

    Warning: cmos checksum invalid

    Warning: cmos time and date not set

In this condition, the BIOS loads default values for CMOS and attempts to boot.

Setup Menus

Setup has six major menus and several submenus. These menus are:

1. Main Menu

   a. Primary IDE Master and Slave

   b. Keyboard Features

2. Advanced Menu

   a. PCI Configuration

      - PCI Device, Embedded SCSI
      - PCI Devices

   b. I/O Device Configuration

   c. Advanced Chipset Control

3. Security Menu

4. Server Menu

   a. System Management

   b. Console Redirection

5. Boot Menu

   a. Boot Device Priority

   b. Hard Drive

6. Exit Menu

Setup Key Commands

Table 8 lists the keys commands available in Setup and what they do.

Table 8: Setup Key Commands

Function	Key Command
Get general help	F1 or ATL+H
Move between menus	← →
Go to the previous item	¦ (colon)
Go to the next Item	Ø (zero)
Change the value of an item	+ or -
Select an item or display a submenu	ENTER
Leave a submenu or exit Setup	ESC
Reset to Setup defaults	F9
Save and exit Setup	F10

Special Display Items

Some items displayed on the screen do not behave as normal fields. These items are either submenus or display-only fields. Table 9 provides more information.

Table 9: Special Display Items

When you see this:	It means this:
On screen, an option is shown but you cannot select it or move to that field.	You cannot change or configure the option in that menu screen. Either the option is autoconfigured or autodetected, or you must use a different Setup screen, or you must use the SSU.
On screen, the phrase **Press Enter** appears next to the option.	Press ENTER to display a submenu that is either a separate full-screen menu or a pop-up menu with one or more choices.

The rest of this section lists the features that display on screen after you press F2 to enter Setup. Not all of the option choices are described, because (1) a few are not user-selectable but are strictly informational, and (2) many of the choices are relatively self-explanatory.

Main Menu

Table 10 lists the selections you can make on the Main Menu itself. Use the submenus for other selections. Default values are in **bold**.

Table 10: Main Menu

Field	Options	Description
System Time	HH:MM:SS	Sets the system time
System Date	MM/DD/YYYY	Sets the system date
Legacy Diskette A:	Disabled 360 KB 720 KB 1.44 MB 2.88 MB	Selects the primary diskette type.
Legacy Diskette B:	Disabled 360 KB 720 KB 1.44 MB 2.88 MB	Selects the secondary diskette type.
Hard Disk Pre-delay	Disabled 3, 6, 9, 12, 15, 21, or 30 seconds	Adds a delay before the first BIOS access of a hard disk drive. Some hard disk drives hang if accessed before they initialize themselves. This delay ensures the hard disk drive has initialized after powerup and before being accessed.
Primary Master	N/A	Enters submenu.
Primary Slave	N/A	Enters submenu.
Keyboard Features	N/A	Enters submenu.
Language	English (US) Spanish Italian French German Japanese (Kanji)	Selects which language the BIOS displays.

● *Note:*

Serial redirection does not work with Kanji.

Primary Master and Slave Submenu

In Table 11, the features other than "Type" appear only for Type Auto, if a drive is detected.

Table 11: Primary IDE Master and Slave Submenu

Field	Options	Description
Type	Auto None CD-ROM IDE Removable ATAPI Removable User	Auto allows the system to attempt autodetection of the drive type. None informs the system to ignore this drive. CD-ROM allows the manual entry of fields described below. User allows the manual entry of all fields described below.
Cylinders	1 to 2048	Number of Cylinders on Drive. This field is changeable only for Type User. This field is strictly informational for Type Auto.
Heads	1 to 16	Number of read/write heads on drive. This field is available only for Type User. This field is strictly informational for Type Auto.
Sectors	1 to 64	Number of sectors per track. This field is available only for Type User. This field is strictly informational for Type Auto.
Maximum Capacity	N/A	Computed size of drive from cylinders, heads, and sectors entered. This field is available only for Type User. This field is strictly informational for Type Auto.
Multi-Sector Transfers	Disabled 2, 4, 8, or 16 sectors	Determines the number of sectors per block for multisector transfers. This field is strictly informational for Type Auto.
LBA Mode Control	Disabled Enabled	Enabling LBA causes logical block addressing to be used in place of cylinders, heads, and sectors. This field is strictly informational for Type Auto.
32 Bit I/O	Disabled Enabled	Enabling allows 32-bit IDE data transfers. This field is strictly informational for Type Auto.
Transfer Mode	Standard Fast PIO 1 Fast PIO 2 Fast PIO 3 Fast PIO 4	Selects the method for moving data to and from the drive. This field is strictly informational for Type Auto.
Ultra DMA	Disabled Enabled	For use with Ultra DMA drives. This field is strictly information for Type Auto.

Keyboard Features Submenu

In Table 12, the settable features of the keyboard controller are listed along with the options.

Table 12: Keyboard Features Submenu

Field	Options	Description
Num Lock	Auto On Off	Selects the power on state for the Num Lock key.
Key Click	Disabled Enabled	Enables or disables key click.
Keyboard auto-repeat rate	30, 26.7, 21.8, 18.5, 13.3, 10, 6, or 2 per second	Selects the key repeat rate.
Keyboard auto-repeat delay	1/4 sec 1/2 sec 3/4 sec 1 sec	Selects the delay before the keys begin to repeat.

Advanced Menu

You can make the selections listed in Table 13 on the Advanced Menu itself. Refer to "PCI Configuration Submenu" on page 88, "I/O Device Configuration Submenu" on page 89, and "Advanced Chipset Control Submenu" on page 91 for information on the three other selections that appear on the Advanced Menu.

Table 13: Advanced Menu

Field	Options	Description
Plug and Play OS	No Yes	Select **Yes** if you are booting a Plug and Play-capable operating system.
Reset Configuration Data	No Yes	Select **Yes** if you want to clear the system configuration data during the next boot. The system automatically resets to **No** during the next boot.
PCI Configuration	N/A	Enters submenu.
I/O Device Configuration	N/A	Enters submenu.
Use Multiprocessor Specification	1.1 1.4	Selects the version of the multiprocessor specification to use. Some operating systems require version 1.1 for compatibility reasons.

Field	Options	Description
Large Disk Access Mode	LBA CHS	Applies to IDE drives only; refers to the method used to access the drive. Most operating systems use logical block addressing (LBA); some use cylinder head sector (CHS). To verify the correct method, consult the operating system documentation.
Pause Before Boot	Enabled Disabled	Enables a five-second pause before booting the operating system.
Advanced Chipset Control	N/A	Enters submenu.

PCI Configuration Submenu

The PCI Configuration Menu contains selections that access other submenus.

PCI Device, Embedded SCSI Submenu

This submenu provides three fields that allow you to control certain characteristics of the embedded SCSI controllers. Table 14 lists the fields and options.

Table 14: PCI Device, Embedded SCSI Submenu

Field	Options	Description
Option ROM Scan	Enabled Disabled	Enables the option ROM scan of the selected device.
Enable Master	Disabled Enabled	Enables the selected device as a PCI bus master.
Latency Timer	Default 0020h 0040h 0060h 0080h 00A0h 00C0h 00E0h	Defines the minimum guaranteed time, in units of PCI bus clocks, that a device can be master on a PCI bus. Typically, option ROM code overwrites the value set by the BIOS.

PCI Devices Submenu

This submenu provides three fields that allow you to control certain characteristics of the PCI expansion slots. Table 15 lists the fields and options.

Table 15: PCI Devices Submenu

Field	Options	Description
Option ROM Scan	Enabled Disabled	Enables the option ROM scan of all devices other than the onboard SCSI controllers.
Enable Master	Disabled Enabled	Enables all devices, other than the onboard SCSI controllers, as PCI bus masters.
Latency Timer	Default 0020h 0040h 0060h 0080h 00A0h 00C0h 00E0h	Defines the minimum guaranteed time, in units of PCI bus clocks, that a device can be master on a PCI bus. Typically, option ROM code overwrites the value set by the BIOS.

I/O Device Configuration Submenu

This submenu contains fields to control the I/O ports on the back panel of the system. Table 16 lists the fields and the options available for each.

Table 16: I/O Device Configuration Submenu

Field	Options	Description
Serial Port A	Disabled Enabled Auto OS Controlled	Auto forces the BIOS to configure the port. OS Controlled is shown when the operating system controls the port.
Base I/O Address	3F8 2F8 3E8 2E8	Selects the base I/O address for COM port A.
Interrupt	IRQ 4 IRQ 3	Selects the IRQ for COM port A.
Serial Port B	Disabled Enabled Auto OS Controlled	Auto forces the BIOS to configure the port. OS Controlled is shown when the operating system controls the port.

Table 16: I/O Device Configuration Submenu (Continued)

Field	Options	Description
Mode	Normal IrDA ASK-IR	Selects the mode for COM port B.
Base I/O Address	3F8 2F8 3E8 2E8	Selects the base I/O address for COM port B.
Interrupt	IRQ 4 IRQ 3	Selects the interrupt for COM port B.
Parallel Port	Disabled Enabled Auto OS Controlled	Auto forces the BIOS to configure the port. OS Controlled is shown when the operating system controls the port.
Mode	ECP Output only Bidirectional EPP	Selects the mode for the parallel port.
Base I/O Address	378 278	Selects the base I/O address for the parallel port.
Interrupt	IRQ 5 IRQ 7	Selects the interrupt for the parallel port.
DMA channel	DMA 1 DMA 3	Selects the DMA channel for the parallel port.
Floppy disk controller	Disabled Enabled	Enables the onboard diskette controller.
Base I/O Address	Primary Secondary	Sets the base I/O address for the diskette controller.
PS/2 Mouse	Auto Disabled Enabled	Enables or disables the onboard mouse. Disabling the mouse frees IRQ 12. If this feature is set to Auto or Enabled, the operating system determines whether to enable or disable the mouse.

Advanced Chipset Control Submenu

The advanced chipset control submenu provides several fields that allow you to control various advanced features of the chipset. Table 17 lists the fields and the options for each.

Table 17: Advanced Chipset Control Submenu

Field	Options	Description
Address Bit Permuting	Disabled Enabled	To be enabled, there must be a power of 2 number of rows (2, 4, 8, or 16), all rows must be the same size, and all populated rows must be adjacent and start at row 0. Two-way or four-way permuting is set automatically based on memory configuration.
Base RAM Step	1 MB 1 KB Every location	Tests base memory once per MB, once per KB, or at every location.
Extended RAM Step	1 MB 1 KB Every location	Tests extended memory once per MB, once per KB, or at every location.
L2 Cache	Enabled Disabled	When enabled, the secondary cache is sized and enabled. For Core Clock Frequency-to-System Bus ratios equal to two, BIOS automatically disables the L2 cache.
ISA Expansion Aliasing	Enabled Disabled	When enabled, every I/O access with an address in the range x100-x3FFh, x500-x7FFh, x900-xBFF, and xD00-xFFFh is internally aliased to the range 0100-03FFh before any other address range checking is performed.
Memory Scrubbing	Disabled Enabled	When enabled, BIOS automatically detects and corrects single bit errors (SBEs).
Restreaming Buffer	Enabled Disabled	When enabled, the data returned and buffered for a Delayed Inbound Read can be reaccessed following a disconnect.
Read Prefetch for PXB0A	N/A	Informational field only. Configures the number of Dwords that are prefetched on Memory Read Multiple commands.
Read Prefetch for PXB0B	N/A	Informational field only. Configures the number of Dwords that are prefetched on Memory Read Multiple commands.

Security Menu

You can make the selections listed in Table 18 on the Security Menu. Enabling the Supervisor Password field forces you to enter a password to access Setup. Passwords are not case sensitive.

Table 18: Security Menu

Field	Options	Description
Administrator Password is	Clear Set	Status only. Once set, you can disable the password by setting it to a null string (press ENTER without typing any other characters) or by clearing the password jumper on the system board (see "Security Add-in" on page 116).
User Password is	Clear Set	Status only. Once set, you can disable the password by setting it to a null string or by clearing the password jumper on the system board (see "Security Add-in" on page 116).
Set Administrative Password	Press Enter	When you press the ENTER key, you are prompted for a password; press the ESC key to cancel. Once set, you can disable the password by setting it to a null string or by clearing the password jumper on the system board (see "Security Add-in" on page 116).
Set User Password	Press Enter	When you press the ENTER key, you are prompted for a password; press the ESC key to cancel. Once set, you can disable the password by setting it to a null string or by clearing the password jumper on the system board (see "Security Add-in" on page 116).
Password on Boot	Disabled Enabled	If enabled and the user password is set, the system prompts you for a password before the system boots.
Fixed Disk Boot Sector	Normal Write Protect	Write-protects the boot sector on the hard disk to protect against viruses.
System Backup Reminder	Disabled Daily Weekly Monthly	Displays the system-backup reminder message at boot.
Virus Check Reminder	Disabled Daily Weekly Monthly	Displays the virus-check reminder message at boot.
Secure Mode Timer	Disabled 1, 2, 5, 10, or 20 min 1 or 2 hr	Defines the period of keyboard or PS/2 mouse inactivity specified for secure mode to activate. A password is required for secure mode to function. This field cannot be enabled unless at least one password is enabled.

Table 18: Security Menu (Continued)

Field	Options	Description
Secure Mode Hot Key (CTRL-ALT-)	[ ] [A, B, ..., Z] [0-9]	Defines the key assigned to invoke the secure mode feature. You cannot enable this field unless at least one password is enabled. Disable this field by entering a new key followed by a backspace or by pressing the DELETE key.
Secure Mode Boot	Disabled Enabled	Causes the system to boot in secure mode. You must enter a password to unlock the system. You cannot enable this field unless at least one password is enabled.
Video Blanking	Disabled Enabled	Blanks the video when secure mode is activated. You must enter a password to unlock the system. You cannot enable this field unless at least one password is enabled.
Floppy Write Protect	Disabled Enabled	When secure mode is activated, this field write protects the diskette drive. You must enter a password to reenable diskette writes. You cannot enable this field unless at least one password is enabled.

Server Menu

The server menu contains three fields that allow you to perform server specific management functions. Two of these fields open submenus. Table 19 lists the fields and the options available for each.

Table 19: Server Menu

Field	Options	Description
System Management	N/A	Enters submenu.
Console Redirection	N/A	Enters submenu.
Processor Retest	No Yes	Instructs the BIOS to clear the historical processor status and to retest all processors on the next boot.

System Management Submenu

The system management submenu provides eight fields that allow you to set system management characteristics. Table 20 lists the fields and the options for each.

Table 20: System Management Submenu

Field	Options	Description
Server Management Mode	Disabled Enabled	**Enabled** loads the Server Management Interrupt handler, which handles system errors.
System Event Logging	Disabled Enabled	**Enabled** forces the BIOS and the BMC to log system events.
Clear Event Log	Disabled Enabled	**Enabled** clears the system event log.
Assert NMI on AERR	Disabled Enabled	**Enabled** generates a nonmaskable interrupt (NMI) on an address parity error (AERR).
Assert NMI on BERR	Disabled Enabled	**Enabled** generates an NMI on a bus error (BERR).
Assert NMI on PERR	Disabled Enabled	**Enabled** generates an NMI on a parity error (PERR). To activate this feature, the system error (SERR) option must be enabled.
Assert NMI on SERR	Disabled Enabled	**Enabled** generates an NMI on a SERR.
Enabled Host Bus Error	Disabled Enabled	Enables host single-bit errors (SBEs) and multiple-bit errors (MBEs).

Console Redirection Submenu

The console redirection submenu provides four fields that allow you to control the redirection of system management data to a remote console. Table 21 lists the fields and the options for each.

Table 21: Console Redirection Submenu

Field	Options	Description
COM Port Address	Disabled 3F8 2F8 3E8	When enabled, console redirection uses the I/O port specified. When disabled, console redirection is completely disabled.
IRQ #	None, 3, or 4	When console redirection is enabled, this field displays the IRQ assigned based on the address chosen in the *COM Port Address* field.

Table 21: Console Redirection Submenu (Continued)

Field	Options	Description
Baud Rate	9600 19.2k 38.4k 115.2k	When console redirection is enabled, this field selects the baud rate. When the Emergency Management Port (EMP) shares the COM port as console redirection, the baud rate must be set to 19.2k to match the EMP baud rate, unless you use the autobaud feature.
Flow Control	No flow control CTS/RTS XON/XOFF CTS/RTS + CD	**None** disallows flow control. **CTS/RTS** is hardware flow control. **XON/XOFF** is software flow control. **CTS/RTS +CD** is hardware plus carrier-detect flow control.

Boot Menu

The boot menu contains seven fields that allow you to control the boot process. Three of these fields open submenus. Table 22 lists the fields and the options for each.

Table 22: Boot Menu

Field	Options	Description
Floppy Check	Disabled Enabled	If **Enabled**, system verifies the diskette type on boot. **Disabled** results in a faster boot.
Multi-boot Support	Disabled Enabled	This option should remain enabled unless you install more than eight hard drives in the system.
Boot Device Priority	N/A	Enters submenu.
Hard Drive	N/A	Enters submenu.
Removable Devices	N/A	Enters submenu.
Maximum Number of I2O Drives	1 4	Selects the maximum number of I_2O drives assigned a DOS drive letter.
Message Timeout Multiplier	1, 2, 8, 10, 50, 100, 1000	All timeout values are multiplied by this number.

Boot Device Priority Submenu

The boot device priority submenu allows you to set the relative priority of boot devices. The device identified as priority one is the first device searched for boot data. If that device does not have boot data or is not ready, the system looks for boot data on the second priority device and so on.

Use the up- or down-arrow keys to select a device. Press the + or - keys to move the device higher or lower in the boot priority list. Table 23 shows the structure of the boot device priority submenu.

Table 23: Boot Device Priority Submenu

Priority	Device	Description
1.	Diskette drive	Attempts to boot from drive A.
2.	Removable devices	Attempts to boot from a removable media device
3.	Hard drive	Attempts to boot from a hard drive.
4.	ATAPI CD-ROM drive	Attempts to boot from an ATAPI CD-ROM drive

Hard Drive Submenu

The hard drive submenu allows you to set the priority of the hard drives in respect to the boot sequence. For options on this menu, use the up or down arrow keys to select a device. Press the + or - keys to move the device higher or lower in the boot priority list. Table 24 shows the manner in which the drives are displayed.

Table 24: Hard Drive Submenu Boot Sequence

Option	Description
1. Drive #1 (or actual drive string)	N/A
2. Other bootable drives (additional entries for each drive that has a PnP header)	Covers all the boot devices that are not reported to the system BIOS through the BIOS boot specification mechanism.

Exit Menu

The exit menu provides four commands. Select an option using the up or down arrow keys. Press ENTER to run the option. Pressing ESC does not exit this menu. You must select one of the items from the menu or menu bar to exit. Table 25 lists the options available and their functions.

Table 25: Exit Menu Command Options

Command	Description
Exit Saving Changes	Exits after writing all modified Setup item values to NVRAM.
Exit Discarding Changes	Exits leaving NVRAM unmodified and continues POST. You are prompted if any of the Setup fields were modified.
Load Setup Defaults	Loads the default values for all Setup items.
Load Custom Defaults	Loads the settings from custom defaults.

Upgrading the BIOS

Upgraded BIOS code is made available periodically. You should check the website regularly, especially if you have a problem with the server that is running BIOS Setup.

Preparing for the Upgrade

Before you upgrade the BIOS, prepare for the upgrade by recording the current BIOS settings, obtaining the upgrade utility, and making a copy of the current BIOS.

Recording the Current BIOS Settings

Remember to record the current BIOS settings. The upgrade process should preserve most settings, but some options may no longer be available or some options may change. Check the settings after the update to verify that the current settings are correct.

To Record the Current BIOS Settings

● *Note:*

Do not skip step 2. You will need these settings to configure your computer at the end of the procedure.

1. Boot the computer and press F2 when you see the message:

    Press <F2> Key if you want to run Setup

2. Write down the current settings from the BIOS Setup program.

Obtaining the Upgrade Utility

● *Note:*

Please review the instructions distributed with the upgrade utility before attempting a BIOS upgrade.

You can upgrade to a new version of the BIOS using the new BIOS files and the BIOS upgrade utility, iFLASH.EXE. You can obtain the BIOS upgrade file and the iFLASH.EXE utility through your computer supplier or from the Intel World Wide Web site: http://www.intel.com.

This upgrade utility allows you to:

- Upgrade the BIOS in flash memory.
- Update the language section of the BIOS.

The following steps explain how to upgrade the BIOS.

Creating a Bootable Diskette

The upgrade process requires you to boot the server from the diskette drive. You may need to redefine the boot sequence to set the diskette drive as the first priority boot device.

To Create a Bootable Diskette

1. Use a DOS or Windows 95 system to create the diskette.

2. Insert a diskette in drive A.

3. At the C:\ prompt, for an unformatted diskette, type:

   format a:/s

   or, for a formatted diskette, type:

   sys a:

4. Press ENTER.

Creating the BIOS Upgrade Diskette

The BIOS upgrade file is a compressed self-extracting archive that contains the files you need to upgrade the BIOS.

To Create the BIOS Upgrade Diskette

1. Copy the BIOS upgrade file to a temporary directory on your hard disk.

2. From the C:\ prompt, change to the temporary directory.

3. To extract the file, type the name of the BIOS upgrade file, for example:

   10006BI1.EXE

4. Press ENTER. The extracted file contains the following files:

   LICENSE.TXT

   README.TXT

   BIOS.EXE

5. Read the LICENSE.TXT file, which contains the software license agreement, and the README.TXT file, which contains the instructions for the BIOS upgrade.

6. Insert the bootable diskette into drive A.

7. To extract the BIOS.EXE file to the diskette, change to the temporary directory that holds the BIOS.EXE file and type:

   BIOS A:

8. Press ENTER.

9. The diskette now holds the BIOS upgrade and recovery files.

Upgrading the BIOS

The BIOS upgrade takes the server out of commission for a short time. Make sure that there are no running processes or other critical activities ongoing at the time you begin the BIOS upgrade.

To Upgrade the BIOS

1. Boot the server with the diskette in drive A. The BIOS upgrade utility screen appears.

2. Select **Update Flash Memory From a File**.

3. Select **Update System BIOS**. Press ENTER.

4. Use the arrow keys to select the correct .bio file. Press ENTER.

5. When the utility asks for confirmation that you want to flash the new BIOS into memory, select **Continue with Programming**. Press ENTER.

6. When the utility displays the message that the upgrade is complete, remove the diskette. Press ENTER.

7. Reboot the server. As the server boots, check the BIOS identifier (version number) to verify that the upgrade was successful.

8. To enter the Setup program, press F2 when you see the message:

   Press <F2> Key if you want to run SETUP

9. For proper operation, load the Setup program defaults. To load the defaults, press F9.

10. To accept the defaults, press ENTER.

11. Set the options in the Setup program to the settings you wrote down before the BIOS upgrade.

12. To save the settings, press F10.

13. To accept the settings, press ENTER.

14. Turn off the computer and reboot.

Recovering the BIOS

It is unlikely that anything will interrupt the BIOS upgrade; however, if an interruption occurs, the BIOS may be damaged. In that case, you must recover the BIOS.

The procedure for recovering the BIOS is detailed in "Recovery Boot Jumper" on page 75. After performing the procedure, leave the upgrade disk in drive A and turn on the server, then continue with the BIOS upgrade (see "Upgrading the BIOS" on page 98).

Changing the BIOS Language

You can use the BIOS upgrade utility to change the language the BIOS displays. Use a bootable diskette containing the flash utility and language files (see "Creating the BIOS Upgrade Diskette" on page 99).

To Change the BIOS Language

1. Boot the computer with the bootable diskette in drive A. The BIOS upgrade utility screen appears.

2. Select **Update Flash Memory From a File**.

3. Select **Update Language Set**. Press ENTER.

4. Select drive A and use the arrow keys to select the correct .lng file. Press ENTER.

5. When the utility asks for confirmation that you want to flash the new language into memory, select **Continue with Programming**. Press ENTER.

6. When the utility displays the message upgrade is complete, remove the diskette. Press ENTER.

7. Reboot the computer and the changes will take effect.

The Server Setup Utility

6

Contents

Introduction

This chapter describes the Power-on Self Test (POST) and system configuration utilities. These utilities are:

- BIOS Setup: described in Chapter 5, "BIOS Setup" on page 79. If the system does not have a diskette drive, or the drive is disabled or misconfigured, use Setup to enable it.

    Or, you can move the CMOS jumper on the system board from the default setting (Protect CMOS memory) to the Clear setting; doing so allows most system configurations to boot. Then run the SSU to configure the system.

- POST: described in Chapter 7, "Other Utilities" on page 125. POST checks basic system integrity and all major components.

- Emergency Management Port (EMP) Console: described in Chapter 7, "Other Utilities" on page 125. Use the EMP to access and monitor the server remotely.

- FRUSDR Load Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the Field Replacement Unit (FRU), Sensor Data Record (SDR), and Desktop Management Interface (DMI) flash components.

- BIOS Update Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the BIOS or recover from a corrupted BIOS update.

- Firmware Update Utility: described in Chapter 7, "Other Utilities" on page 125. Use to update the BMC flash ROM.

- Symbios SCSI Utility: described in Chapter 7, "Other Utilities" on page 125. Use to configure or view the settings of the SCSI host adapters and onboard SCSI devices in the system.

Use the SSU for extended system configuration of onboard resources and expansion cards, viewing the system event log (SEL), setting boot device priority, or setting system security options.

Run the SSU from a set DOS-bootable diskettes. See "What You Need to Do" on page 106 to make a set of SSU diskettes.

Information entered via the SSU overrides information entered via Setup.

Using the System Setup Utility

The system setup utility (SSU) is provided on a set of diskettes shipped with the server. The SSU provides a graphical user interface (GUI) over an extensible framework for server configuration. The SSU framework supports the following functions and capabilities:

- Assigns resources to system board devices and expansion cards before loading the operating system
- Lets you specify boot device order and system security options
- Permits viewing and clearing of the system event log (SEL)
- Permits viewing of the system field replaceable units (FRUs) and sensor data record (SDR).
- Allows troubleshooting of the server when the operating system is not operational
- Provides a system-level view of the server I/O devices

When to Run the SSU

The SSU is a DOS-based utility that supports extended system configuration operations for onboard resources and expansion cards. Use the SSU when you need to:

- Add and remove boards affecting the assignment of resources (ports, memory, IRQs, DMA)
- Modify the server boot device order or security settings
- Change the server configuration settings
- Save the server configuration
- View or clear the system event log (SEL)
- View FRU information
- View the SDR table

If you install or remove an ISA expansion card, you must run the SSU to reconfigure the server. Running the SSU is optional for PCI and Plug and Play ISA expansion cards.

The SSU is PCI-aware and complies with the ISA Plug and Play specification; it works with any compliant configuration (.CFG) files supplied by the peripheral device manufacturer.

The system board comes with a .CFG file describing the characteristics of the board and the system resources it requires. The configuration registers on PCI and ISA Plug and Play expansion cards contain the same type of information in a .CFG file. Some ISA boards also come with a .CFG file.

The SSU uses the information provided by .CFG files, configuration registers, flash memory, and the information that you enter, to specify a system configuration. The SSU then writes the configuration information to flash memory.

The configuration values in flash memory take effect when you boot the server. POST checks the values against the actual hardware configuration; if the values do not agree, POST generates an error message. You must then run the SSU to specify the correct configuration before the server boots.

The SSU always includes a checksum with the configuration data so the BIOS can detect any potential data corruption before the actual hardware configuration takes place.

What You Need to Do

You must run the SSU from a set of DOS diskettes. You must follow the instructions in the included README.TXT file to prepare the diskettes.

If your diskette drive is disabled or improperly configured, you must use the flash-resident Setup utility to enable it so you can use the SSU. If necessary, disable the drive after exiting the SSU. Information entered using the SSU overrides any entered using Setup.

Running the SSU

The SSU can be run either locally (directly on the server you are configuring) or remotely (on a workstation connected to the server you are configuring through the network).

Running the SSU Locally

Running the SSU.BAT file starts the SSU. If the server boots directly from the SSU media, the SSU.BAT file runs automatically. If the server boots from different media, the SSU can be started manually or by another application. When the utility starts in the local execution mode (the default mode), the SSU accepts input from the keyboard and/or mouse. The SSU provides a VGA-based GUI on the primary monitor.

The SSU runs from writable, nonwritable, removable, and nonremovable media. If the SSU is run from nonwritable media, user preference settings (like screen colors) cannot be saved.

The SSU supports the ROM-DOS V6.22 operating system. It can run on other ROM-DOS compatible operating systems, but they are not supported. The SSU will not operate from a "DOS window" running under an operating system like Windows.

Running the SSU Remotely

To run the SSU remotely, you must invoke the SSU.BAT file with the /t switch and redirect the text-mode output via BIOS console redirect. See "Console Redirection Submenu" on page 94 for instructions on setting up the remote console.

Starting the SSU

The SSU is a collection of task-oriented modules plugged into a common framework called the Application Framework (AF). The AF provides a launching point for individual tasks and a location for setting customization information.

To Start the SSU

1. Turn on the video monitor and the system.

2. Start the SSU by inserting the bootable SSU diskette into drive A. Press the reset button or CTRL+ALT+DEL to reboot. When prompted to do so, press F2 to enter the BIOS Setup. From the boot menu, select the **Boot Device Priority** option. Select diskette drive as your primary boot device. Save those settings and exit the BIOS Setup. The server will boot from the diskette drive and display a menu of options. Follow the instructions in the menu to start the SSU.

3. When the SSU title appears on the screen, press ENTER to continue.

4. The mouse driver loads if it is available; press ENTER to continue.

   This message appears:

   Please wait while the Application Framework loads....

   When the main window of the SSU appears (Figure 30), you can customize the user interface (UI) before continuing. See "Customizing the SSU" on page 109.
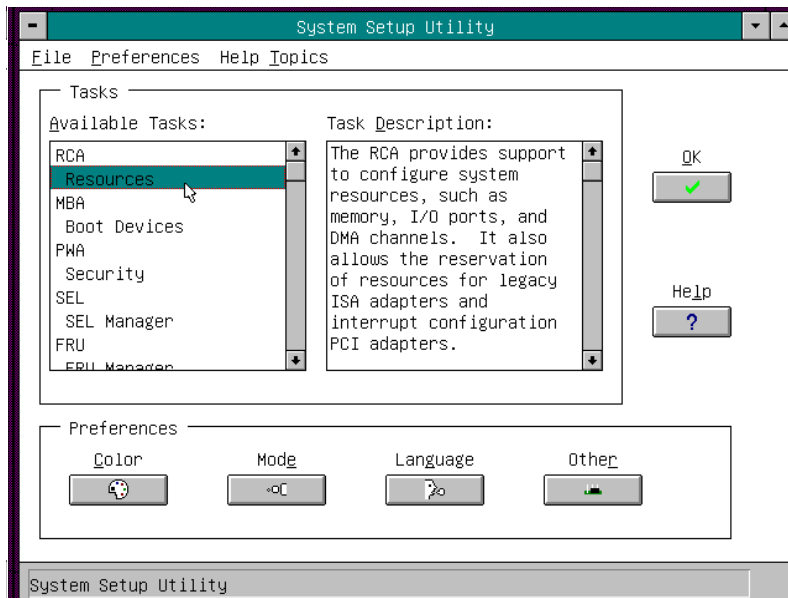
Figure 30: SSU Main Window

Customizing the SSU

You can customize the UI according to your preferences. The AF sets these preferences and saves them in the AF.INI file so that they take effect the next time you start the SSU. Use these four user-customizable settings:

- **Color**—lets you change the default colors associated with different items on the screen to predefined color combinations. The changes are instantaneous.

- **Mode**—lets you set the desired expertise level.
  - Novice
  - Intermediate
  - Expert

The expertise level determines which tasks are visible in the Available Tasks section and what actions each task performs. For a new mode setting to take effect, you must exit the SSU and restart it. In the current implementation, there is no distinction between these three different modes.

- **Language**—lets you change the strings in the SSU to the appropriate language. For a new language setting to take effect, you must exit the SSU and restart it.

- **Other**—lets you change other miscellaneous options in the SSU. The changes are instantaneous.

To Change the Interface Default Values

- Use the mouse to click on the proper button in the Preferences section of the SSU Main window.

  OR

- Use the tab and arrow keys to highlight the desired button, and press the spacebar or ENTER.

  OR

- Access the menu bar with the mouse or hot keys (ALT + the underlined letter).

Launching a Task

It is possible to have many tasks open at the same time, although some tasks might require complete control to avoid possible conflicts. The tasks achieve complete control by commanding the center of operation until you close the task window.

To Launch a Task

- In the SSU Main window, double-click on the task name under *Available Tasks* to display the main window for that task.

  OR

- Highlight the task name, and click **OK**.

  OR

- Use the tab and arrow keys to highlight the desired button, and press the spacebar or ENTER.

Resource Configuration Add-in Window

The resource configuration add-in (RCA) window provides three major functions:

- Creates representations of devices that cannot be discovered by the system (ISA boards)
- Modifies the contents of the system by adding and removing devices
- Modifies the resources used by devices

Using the RCA Window

You can use the RCA window to define or add an ISA board by clicking on the appropriate button. To remove an ISA board, highlight the board in the Devices section of the screen before clicking on the button. You can add only as many ISA boards as there are ISA slots available.

To Use the RCA Window

1. From the SSU main window, launch the RCA by selecting the **Resources** task under the RCA heading in the task box.

2. When the RCA window appears, it displays messages similar to the following:

   Baseboard: System Board

   PCI Card: Bus 00 dev 00 -– Host Processor Bridge

   PCI Card: Bus 00 dev 0D –- Multifunction Controller

   PCI Card: Bus 00 dev 0F –- Ethernet Controller

   PCI Card: Bus 00 dev 12 –- Multifunction Controller

   PCI Card: Bus 00 dev 14 –- VGA Controller

3. To configure a device, click on it or select its name in the Devices section of the RCA window and press the spacebar or ENTER.

4. You can close the RCA window and return to the AF by clicking on the **Close** button. Any changes made are kept in memory for use by the RCA when it is rerun.

5. Save all changes by clicking **Save**. Saving writes your current configuration to nonvolatile storage where it is available to the system after every reboot.

6. Close the window by clicking on the system menu (the dash in the upper-left corner) to discard all changes that have not been saved.

Defining an ISA Board

An ISA board usually comes with a vendor-created .CFG file that specifies the resources the card requires to function properly. If the .CFG file is unavailable, you must manually create it or define the board through the SSU. Defining an ISA board consists of specifying the name of the board and the resources it consumes. This allows the RCA to consider the ISA board resource requirements when the RCA tries to resolve conflicts. BIOS also uses this information to configure hardware when the system is booted.

To Define an ISA Board

1. To add or remove ISA board resources, click on the appropriate resource buttons, select the desired value, and click **Add** or **Remove**.

2. After you complete the necessary information, click **Save**.

3. To edit a board, click **Load** to retrieve the board information. After making changes, click **Save**.

4. To create a board, click **New**.

5. To remove a current definition of a board, click **Delete**.

Adding and Removing ISA Boards

Adding and removing boards through the RCA provides a way for the RCA to run its conflict detection algorithms on the resources requested by the boards. This alerts you to any possible problems with that particular board in the current configuration.

To Add an ISA Board

1. Click **Add ISA Board** in the RCA window.

2. Specify the directory for the .CFG file.

3. Select the file and click **OK**.

To Remove an ISA Board

1. Select a valid ISA board in the Devices section of the RCA window.

2. Click **Remove ISA Board**.

Modifying Resources

Modifying the resources of a device may be necessary to accommodate certain operating systems, applications, and drivers. You may also need to modify resources to resolve a conflict.

To Modify Device Resources

1. Highlight the device in the Devices section of the RCA window.

2. Press the spacebar or ENTER, or double-click on the entry.

   This displays the functions of the selected device along with any possible choices and the resources associated with those choices.

1. Highlight the function in the Configuration window.

2. Press the spacebar or ENTER, or double-click on the entry (this updates the choice and resource lists).

3. Press the tab key to get to the choice list, and press ENTER.

4. Use the arrow keys to select a proper choice, and press ENTER again.

5. If the choice allows multiple possible values for a particular resource, use the hot key to select a resource and press the spacebar or double-click on the resource.

6. Select the desired resource, and click **OK**.

System Resource Usage

Click **Resource Use** in the Configuration window to display the System Resource Usage window, which shows the resources each device consumes. This information is useful if a conflict occurs. Devices can be organized according to the resources you want to examine using the options in the Resource section of the screen. The resource information can also be written to a plain text file through this window.

Multiboot Options Add-in

In this window, you can change the boot priority of a device.

To Change the Boot Priority of a Device

1. Select a device.

2. Press + to move the device up in the list (higher priority). Press - to move it down.

Security Add-in

In this window, you can set the User and Administrator passwords and security options.

To Set the User Password

1. Click **User Password**.

2. Enter the password in the first field.

3. Confirm the password by entering it again in the second field.

To Change or Clear the User Password

1. Click **User Password**.

2. Enter the old password in the first field.

3. Enter the new password in the second field (or leave blank to clear).

4. Confirm the password by entering it again in the second field (or leave blank to clear).

To Set the Administrator Password

1. Click **Administrator Password**.

2. Enter the password in the first field.

3. Confirm the password by entering it again in the second field.

To Change or Clear the Administrator Password

1. Click **Administrator Password**.

2. Enter the old password in the first field.

3. Enter the new password in the second field (or leave blank to clear).

4. Confirm the password by entering it again in the second field (or leave blank to clear).

Security Options

In this window, you can set the other security options:

- **Hot Key**—sets a key sequence that puts the server into secure mode when the key is pressed.

- **Lock-Out Timer**—sets an interval that puts the server into secure mode when no activity occurs during the interval.

- **Secure Boot Mode**—forces the server to boot directly into secure mode.

- **Video Blanking**—turns off the video when the server is in secure mode.

- **Floppy Write**—controls access to the diskette drive when the server is in secure mode.

- **Reset/Power Switch Locking**—controls the power and reset buttons when the server is in secure mode.

System Event Log Viewer Add-in

Clicking on the system event log (SEL) add-in task brings up the SEL viewer add-in, which allows you to:

- Examine SEL records via the BMC in hex or verbose mode
- Examine SEL records by sensor or event type in hex or verbose mode
- Examine SEL records from a previously stored binary file in hex or verbose mode
- Save SEL records to a file in either text or binary form
- Clear SEL entries from the non-volatile storage area

The SEL viewer main window provides access to features of the add-in. Each option included on the main menu supports an accelerator key. Accelerator keys are indicated by an underlined letter in the text listing the option. The main window includes support to display the following information for each SEL entry: record identifier, event type, time stamp information, generator identifier, EMV revision, sensor type, sensor number, and event description.

Figure 31 shows the SEL viewer main window. Table 26 lists the window's menus and options.
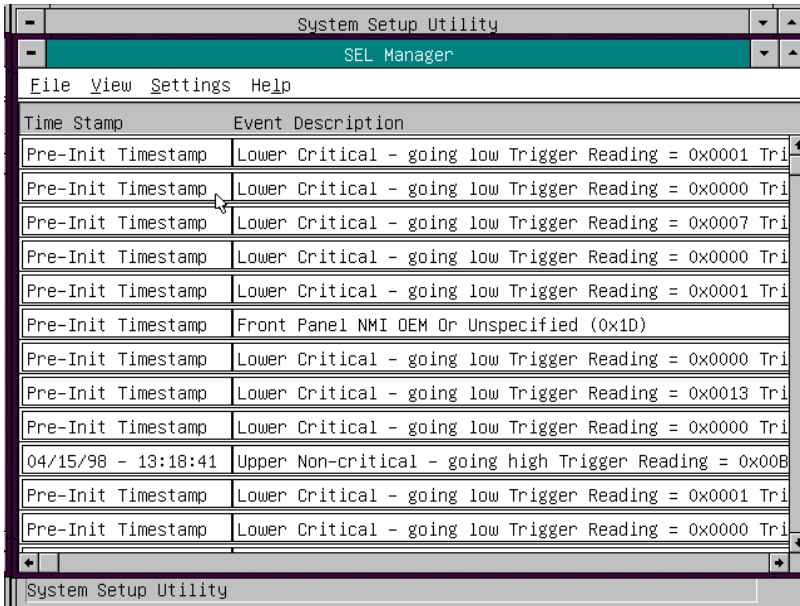
Figure 31: SEL Viewer Add-in Main Window

Table 26: SEL Viewer Menus and Options

Menu	Options
File	Open SEL: Views data from previously saved SEL file Save SEL: Saves the currently loaded SEL data to a file Clear SEL: Clears the SEL data from the BMC Exit: Quits the SEL Viewer
View	SEL Info: Displays information about the SEL (display only) All Events: Displays the current SEL data from the BMC By Sensor: Displays a pop-up menu allowing you to view the data from a certain sensor type By Event: Displays a pop-up menu allowing you to view the data from a certain event type
Settings	Display Hex/Verbose: Toggles between Hex/interpreted mode of displaying the SEL records Output Text/Binary: Determines whether SEL data is saved to the file (under File - Save) in binary format or verbose format
Help	About: Displays the SEL Viewer version information

Sensor Data Record Manager Add-In

In this window, you can:

- Examine all SDR records through the BMC (in either Hex or Verbose mode)
- Examine SDR records by Record type (in either Hex or Verbose mode)
- Examine SDR records from a previously stored binary file (in either Hex or Verbose mode)
- Save the SDR records to a file (in either text or binary form)

The SDR Manager can display SDR records in either raw form (hexadecimal) or in an interpreted, easy-to-understand textual form (verbose).

The SDR Manager's main window provides access to features of the add-in through menus. Each option included on the main menu supports an accelerator key. Accelerator keys are indicated by an underlined letter in the text listing the option.

Figure 32 shows the SDR Manager main window. Table 27 lists the window's menus and options.
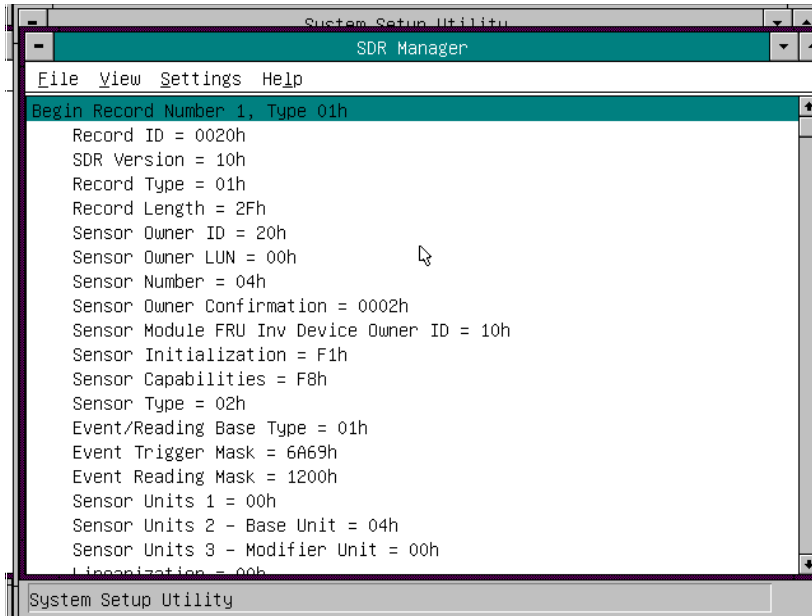
Figure 32: SDR Manager Main Window

Table 27: SDR Manager Menus and Options

Menu	Options
File	Open FRU: Opens FRU data from a previously saved file Save SDR: Saves SDR data to a file in binary raw or verbose text format Exit: Quits the SDR Manager
View	SDR Info: Displays SDR information as returned by the GetSDRInfo interface of the BMC All Records: Displays all records in the SDR repository By Record: Displays all records in the SDR repository, sorted by record type
Settings	Display HEX: Displays SDR records in Hex format Display Verbose: Displays SDR records in verbose format Output Text: Saves SDR data in verbose format Output Binary: Saves SDR data in binary format
Help	About: Displays SDR Manager version information

Field Replaceable Unit Manager Add-In

In this window you can:

- Examine all FRU Inventory areas on the server (in either Hex or Verbose mode)

- Examine individual FRU Inventory areas (in either Hex or Verbose mode)

- Examine FRU Inventory areas from a previously stored binary file (in either Hex or Verbose mode)

- Save the FRU Inventory areas to a file (in either text or binary form)

The FRU Manager can display the FRU Inventory areas in either raw form (hexadecimal) or in an interpreted, easy-to-understand textual form (verbose). The FRU manager's main window provides access to features of the add-in through menus. Each option included on the main menu supports an accelerator key. Accelerator keys are indicated by an underlined letter in the text listing the option.

Figure 33 shows the FRU Manager main window. Table 28 lists the window's menus and options.
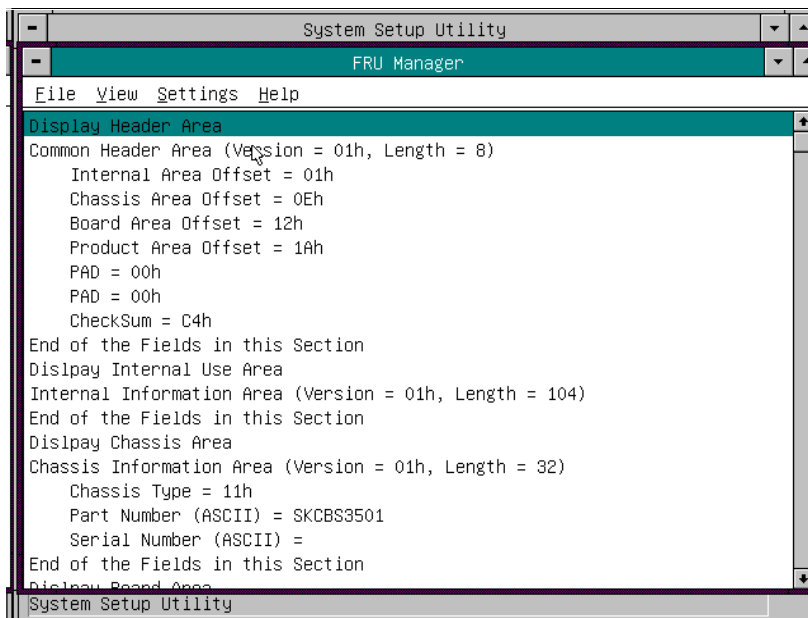
Figure 33: FRU Manager Main Window

Table 28: FRU Manager Menus and Options

Menu	Options
File	Open FRU: Opens FRU data from a previously saved file Save FRU: Saves FRU data to a file in binary raw or verbose text format Exit: Quits the FRU Manager
View	FRU Info: Displays FRU information of the selected device All FRU Areas: Displays FRU areas of all devices By Device Type: Displays FRU areas sorted by device type
Settings	Display HEX: Displays FRU areas in Hex format Display Verbose: Displays FRU areas in verbose format Output Text: Saves FRU data in verbose format Output Binary: Saves FRU data in binary format
Help	About: Displays FRU Manager version information

Exiting the SSU

Exiting the SSU causes all windows to close.

To Exit the SSU

1. Exit the SSU by opening the file menu in the SSU Main window.

2. Click **Exit**

   or

   Highlight **Exit**, and press ENTER.

Other Utilities

Contents

Introduction

This chapter describes the Power-on Self Test (POST) and system configuration utilities. These utilities are:

- POST: described in "Power-on Self Test" on page 127. POST checks basic system integrity and all major components.

- BIOS Setup: described in Chapter 5, "BIOS Setup" on page 79. If the system does not have a diskette drive, or the drive is disabled or misconfigured, use Setup to enable it.

  Or, you can move the CMOS jumper on the system board from the default setting (Protect CMOS memory) to the Clear setting; doing so allows most system configurations to boot. Then run the SSU to configure the system.

- Server Setup Utility (SSU): described in Chapter 6, "The Server Setup Utility" on page 103. Use for extended system configuration of onboard resources and expansion cards, viewing the system event log (SEL), setting boot device priority, or setting system security options.

  Run the SSU from a set DOS-bootable diskettes. See "What You Need to Do" on page 106 to make a set of SSU diskettes.

  Data entered in the SSU overrides data entered in Setup.

- Emergency Management Port (EMP) Console: described in "Emergency Management Port Console" on page 129. Use the EMP to access and monitor the server remotely.

- FRUSDR Load Utility: described in "FRU and SDR Load Utility" on page 145. Use to update the Field Replacement Unit (FRU), Sensor Data Record (SDR), and Desktop Management Interface (DMI) flash components.

- BIOS Update Utility: described in "Upgrading the BIOS" on page 98. Use to update the BIOS or recover from a corrupted BIOS update.

- Firmware Update Utility: described in "Using the Firmware Update Utility" on page 151. Use to update the BMC flash ROM.

- Symbios SCSI Utility: described in "Using the Symbios SCSI Utility" on page 152. Use to configure or view the settings of the SCSI host adapters and onboard SCSI devices in the system.

Power-on Self Test

Each time you turn on the system, the power-on self test (POST) runs. POST checks the system board, processors, memory, keyboard, and most installed peripheral devices. During the memory test, POST displays the amount of memory it is able to access and test. The length of time needed to test memory depends on the amount of memory installed. POST is stored in flash memory.

To Use POST

1. Turn on the monitor and the system. After a few seconds, POST begins to run.

2. After the memory test, these screen prompts and messages appear:

   Keyboard Detected

   Mouse Initialized

   Press <F2> to enter Setup

3. If you do not press F2 and there is no device with an OS loaded, the above message remains for a few seconds while the boot process continues, and the system beeps once. Then this message appears:

   Operating System not found

   If you do not press F2 and do have a device with an OS loaded, the boot process continues and this message appears:

   Press <Ctrl><C> to enter SCSI Utility

4. Press CTRL+C if SCSI devices are installed. When the utility opens, follow the displayed instructions to configure the onboard SCSI host adapter settings and to run the SCSI utilities. Also see "Using the Symbios SCSI Utility" on page 152. If you do not enter the SCSI utility, the boot process continues.

5. Press ESC during POST to access a boot menu when POST finishes. From this menu, you can choose the boot device or enter BIOS Setup.

After POST completes, the system beeps once.

What appears on the screen after this depends on if you have an OS loaded and if so, which one.

If the system halts before POST completes running, it emits a beep code indicating a critical system error that requires immediate attention. If POST can display a message on the video display screen, the speaker beeps twice as the message appears.

Note the screen display and write down the beep code you hear; this information is useful for your service representative. For a listing of beep codes and error messages that POST can generate, see "Solving Problems" on page 159.

Emergency Management Port Console

The emergency management port (EMP) console provides an interface, called the console manager, to the EMP. This interface allows remote server management via a modem or direct connection. The EMP console must be run on a separate (client) system running either Windows 95 or Windows NT.

The following server control operations are available with the console manager:

- Connecting to remote servers
- Powering the server on or off
- Resetting the server
- Switching the server console between EMP active and BIOS re-direct modes

The console manager uses three management plug-ins to monitor the server: the SEL, SDR, and FRU viewers.

The console manager also has a support plug-in phonebook, which you can use to create and maintain a list of servers and their phone numbers. You can launch the Connect dialog directly from the Phonebook dialog to connect to a selected server.

How the EMP Console Works

The EMP shares the COM2 port with the system. When the EMP has control of the port, the port operates in command state. When the system has control of it, the port operates in redirect state. When connecting to a server, the EMP console checks to determine the current COM2 port state.

- • **Command state**—the default COM2 state (Figure 34). In this state, the EMP console communicates with the server firmware, allowing the client to remotely reset or power the server up or down. The client can also view the server SEL, FRU information, or SDR table.
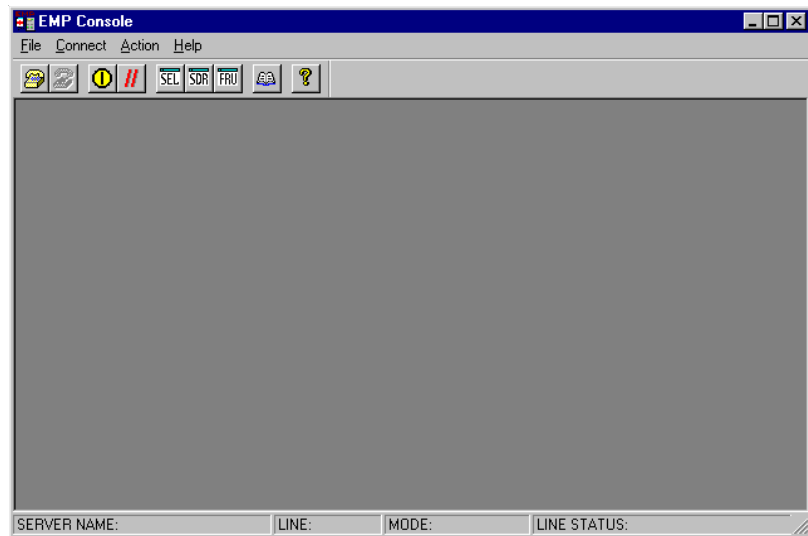
Figure 34: EMP Console in Command State

- **Redirect state**—the EMP console serves as a PC ANSI terminal window for BIOS console redirection (Figure 35). Commands typed in this terminal window are transmitted through BIOS to the server console, and text displayed on the server console is displayed in the EMP console terminal window. With the EMP in this state, you can remotely view boot messages, access BIOS setup, and run DOS text mode applications through the EMP console terminal window.
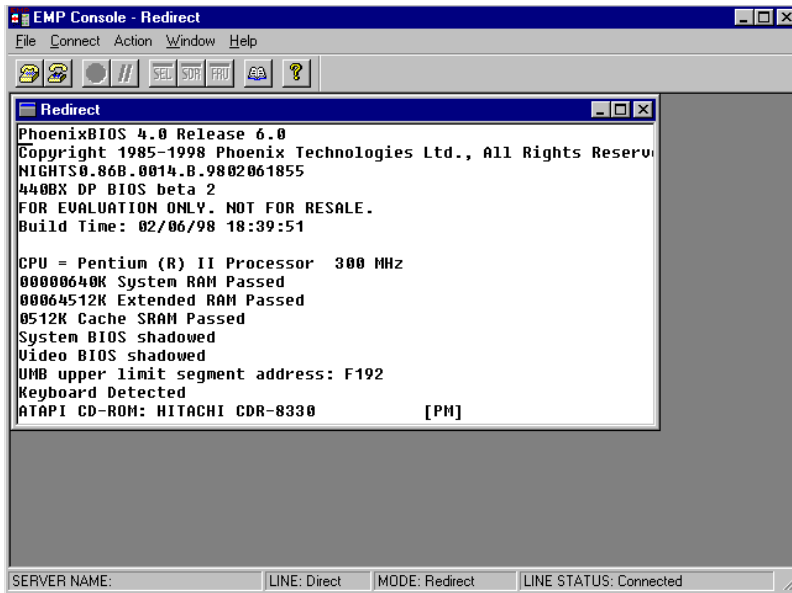
Figure 35: EMP Console in Redirect State

Figure 35 shows the EMP console window in redirect state with the terminal window. The text that appears on the server monitor is also displayed in the redirect window.

Availability of the various EMP console features is determined by two things: the EMP access mode selected during configuration in the System Management Submenu of the BIOS Server Menu (page 133) and whether the server COM2 port is configured for console redirect in the BIOS.

The three EMP access modes are disabled, pre-boot, and always active.

Table 29: EMP Console Access Modes (Server Configured for Console Redirect)

Mode	Server is powered off	During POST	After Operating System boots
Disabled	Redirect window appears, but is blank	Redirect window	Redirect window
Pre-boot	EMP commands available	Redirect window	Redirect window
Always Active	EMP commands available	Redirect window	EMP commands available
* You can modify the operation mode by selections in the POST reset and POST power-up dialogs. These are server control dialogs available with the EMP Console.			

Table 30: EMP Console Access Modes (Server not Configured for Console Redirect)

Mode	Server is powered off	During POST	After Operating System boots
Disabled	Redirect window appears, but is blank	Redirect window appears, but is blank	Redirect window appears, but is blank
Pre-boot	EMP commands available	EMP commands available	Redirect window appears, but is blank
Always Active	EMP commands available	EMP commands available	EMP commands available

EMP Console Requirements

This section outlines the requirements and configurations necessary for using the EMP console.

Operating System, Windows NT:

- Windows NT 4.0 or later
- 24 MB of RAM, 32 MB recommended
- 20 MB disk space

Client Configuration: The EMP console supports all COM ports on the client system, along with any Windows NT/95 compatible modem.

Server Configuration: The EMP console requires that the server COM2 port be connected to an external modem or directly connected to a serial cable.

Direct Connect Configuration: A null modem serial cable is needed. Connect one end of the cable into the COM2 port of the server and the other into a port on the client machine.

Modem Configuration: On the client, the EMP console uses the Windows application program interface (API) to determine if a modem is connected and available. The EMP Console does not configure the modem; it should be preconfigured through Windows.

For modem support, the server must use a Hayes-compatible 14400 bps modem. The modem must be on the NT hardware compatibility list provided by Microsoft. The server modem must be set in autoanswer mode for the EMP console to be able to connect to it.

Setting Up the Server for the EMP

To use the EMP, you must configure the BIOS with specific settings. Enter these settings in two submenus of the BIOS Server Menu: the System Management Submenu ("System Management Submenu" on page 94) and the Console Redirect Submenu ("Console Redirection Submenu" on page 94). The sections below focus on the settings that must be configured to use the EMP.

System Management Submenu

All EMP-related settings occur from the System Management Submenu of the server Main Menu. Change only the items below; all other default settings should remain the same.

EMP Password: Any time you attempt to initiate a connection, a prompt for the user password appears. If you never set up the EMP password, anyone can access the EMP by clicking **OK** through the password prompt.

In the EMP password area of the System Management Submenu, type in a password of up to eight alphanumeric characters. If the system beeps, the password was not accepted; you must enter a different password.

EMP Access Modes: Choose either disabled, pre-boot, or always active, depending on the type of EMP access needed. Table 29 on page 132 and Table 30 on page 132 list what is available with a given setting.

EMP Restricted Mode Access: Set restricted mode to either enabled or disabled. In enabled mode, the EMP console server control options, Power On/Off and Reset, are NOT available. In disabled mode, these options are available.

EMP Direct Connect/Modem Mode: Select Direct Connect if a null modem serial cable directly connects the server COM2 port to the EMP console client machine. If they are connected via a modem, select Modem Mode.

Console Redirection Submenu

To use the EMP, you must set the following options exactly as noted.

COM Port Address: Select 2F8. This is the COM2 port that the EMP must use. The IRQ# setting is automatically assigned with the correct number based on the COM port address choice.

Baud Rate: Select 19.2k.

Console Type: Choose PC ANSI.

Flow Control: Choose CTS/RTS + CD.

Main EMP Console Window

The main EMP console window provides a graphical user interface (GUI) to access server control operations and to launch the management plug-ins. A menu and tool bar at the top of the GUI provide options to initiate plug-ins and other support features. A status bar at the bottom displays connection information like server name, line status, and mode.

Toolbar

The tool bar buttons (Table 31) combine server control and management plug-in options available from the Connect and Action menus.

Table 31: Toolbar Buttons

	Connects to a selected server
	Disconnects from the currently connected server
	Powers the selected server on or off
	Resets the selected server
	Opens the SEL viewer
	Opens the SDR viewer
	Opens the FRU viewer
	Opens the Phonebook
	Opens online help

Status Bar

The status bar is displayed at the bottom of the current window. It contains the following status information:

- **Server Name**: The name of the connected server.
- **Line**: The type of line connection (direct or modem).

- **Mode**: Either redirect or EMP, depending on whether the EMP has control of the COM2 port.

- **Line Status**: Gives status information on the server connection. For example, if a server is connected, the status bar says "Connected." Otherwise, the line is blank.

EMP Console Main Menu

- File
  - **Exit:** Exits the EMP console
- Connect
  - **Disconnect:** Disconnects the server connection.
  - **[Re]Connect:** Raises the connect dialog.
  - **(A list of the five most recent connections):** Initiates connection to selected server.
- Action
  - **Power On/Off:** Powers the server on or off with POST power-up options.
  - **Reset:** Resets the server with POST reset options.
  - **SEL Viewer:** Opens the SEL viewer.
  - **SDR Viewer:** Opens the SDR viewer.
  - **FRU Viewer:** Opens the FRU viewer.
  - **Phonebook:** Opens the phonebook dialog.
- **Help:** Provides version information and help topics for the EMP console.

Server Control Operations

Three server control operations are available from the menu or toolbar of the main EMP console window, remote server connection, powering the server on and off, and resetting the server. The server console mode can also be switched between EMP active and BIOS redirect modes through POST power-up and reset options.

Connect to Remote Server

Select [Re]Connect from the Connect menu and follow the Connect dialog shown in Figure 36 allows you to connect to a selected server. If the client machine is already connected to a server, initiating connection generates a warning message. The message states that the existing connection will be terminated if you continue trying to initiate the new connection. You are prompted to enter the EMP password whenever a connection is attempted.
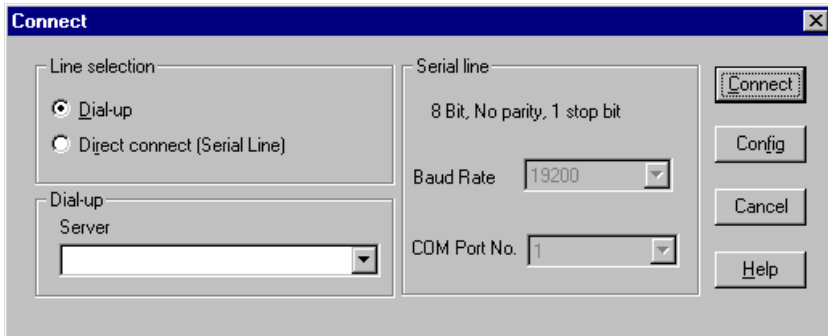
Figure 36: Connect Dialog

Options available in the dialog are:

- **Line Selection:** Allows distinction between direct or dial-up modem connection to the server.

  - **Dial-up:** Connects to a selected server with a modem.

  - **Direct connect (Serial Line):** Connects to the selected server directly using a null modem serial cable.

- **Server:** Displays a list of available servers in a dropdown edit list box. You can select or enter a server name; a server must be selected wen the line selection is dial-up.

- **Serial Line:** Must be filled out when the line selection is set to direct connect (serial line).

  - **Baud Rate:** Specifies baud rate; must be 19200 for EMP to connect properly.

  - **COM Port No.:** Sets the COM port number to which the null modem serial cable is connected.

- **Connect:** Initiates connection to the server. When you click this button, you are prompted for the EMP password.

- **Config:** Displays the Phonebook dialog.

- **Cancel:** Exit the Connect dialog with no action taken.

- **Help:** Display dialog-level help information.

Power On/Off the Server Remotely

Selecting Power On/Off from the Action Menu allows you to power the server on or off, with POST power-up options. It generates the Power on/off dialog (Figure 37).
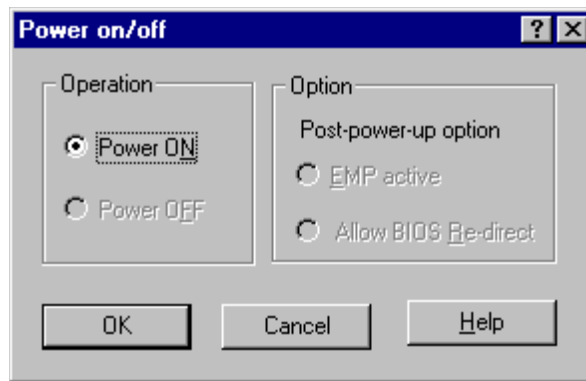
Figure 37: Power On/Off Dialog

Options available in the dialog are:

- **Power ON:** Powers on the server.

- **Power OFF:** Powers off the server. This option is not allowed if the server is configured in restricted mode for EMP operations.

- **Post-power-up option:** Sets the server mode EMP active or BIOS redirection. The setting is effective at the next power-up. The default selection is EMP active.

- **Cancel:** Exits the dialog with no action taken.

- **Help:** Displays dialog-level help information.

Reset the Server Remotely

Selecting Reset from the Action Menu generates the Reset dialog (Figure 38) so that you can remotely reset the server with POST reset options.
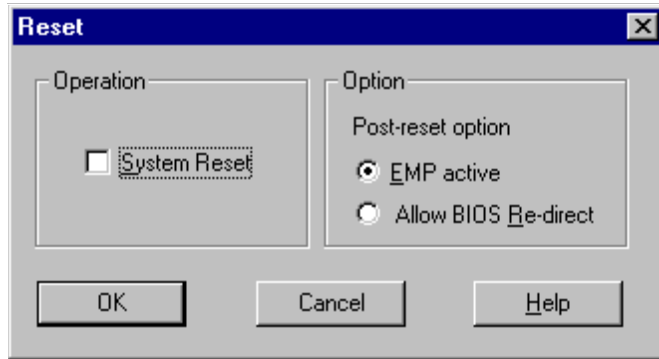
Figure 38: Reset Dialog

Options available in the dialog are:

- **System Reset:** Resets the server with the selected POST reset options. This operation is not allowed if the server is configured in restricted mode for EMP operations.

- **Option Group:** Sets the POST reset option that will be effective after reset. The options are EMP active or BIOS redirection. The default selection is EMP active.

- **Cancel:** Exits the dialog with no action taken.

- **Help:** Displays dialog-level help information.

Phonebook

The EMP console provides a phonebook (Figure 39), a support plug-in that stores names and numbers of servers in a list that can be updated by adding, modifying, or deleting entries. You can open the phonebook from the Main Menu and tool bars, or launch it by clicking the Config button.
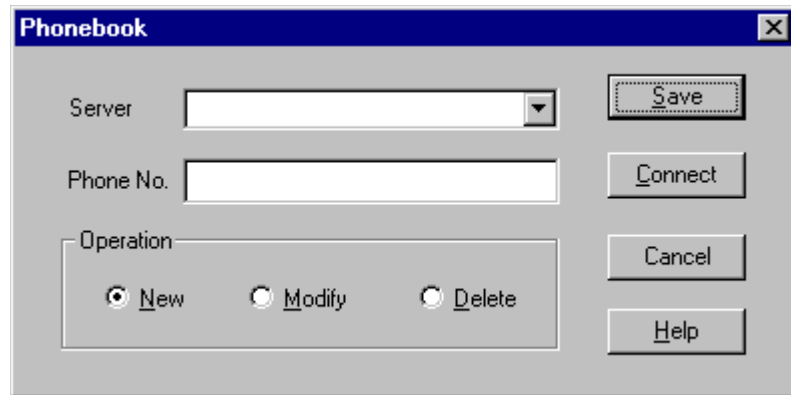
Figure 39: Phonebook Dialog

Options available in the dialog are:

- **Server:** Displays a dropdown list of server names previously stored in the phonebook. If the New radio button is selected in the Operation area, the server area is cleared.

- **Phone No.:** Displays the number of the selected server. If the New radio button is selected in the Operation area, this area is cleared.

- Operation

    - **New:** Makes a new entry in the phonebook. Selecting this option clears the Server and Phone No. fields. You must click **Save** to add the entry to the phonebook.

    - **Modify:** Edits an existing entry. Before selecting this option, you must first select an existing entry from the Server dropdown edit box and modify the existing phone number. Click **Save** to store this entry in the phonebook.

- **Delete:** Deletes an entry from the phonebook. You must first select an existing server from the Server dropdown edit box before selecting this option. Click **Save** to delete the entry.

- **Save:** Saves a new or modified phonebook entry or deletes an entry if you have already selected the Delete radio button.

- **Connect:** Raises the Connect dialog with the server from the phonebook Server dropdown edit box already populating the Connect dialog Server dropdown edit box.

- **Cancel:** Exits the dialog with no action taken.

- **Help:** Displays dialog-level help information.

Management Plug-ins

System Event Log Viewer

The system event log (SEL) viewer can display records in either hexadecimal or text (verbose) form. These options are available through the SEL viewer:

- View the SEL from a file
- Save the SEL to a file
- View SEL summary information
- View all SEL entries
- View SEL info by event type
- View SEL info by sensor type
- Set SEL display mode to either Hex or verbose mode
- Set the SEL output file format to either text or binary format
- Close the SEL viewer
- Exit the EMP console

SEL Viewer Menu Options

The following menu options are available on the SEL viewer menu bar:

- **File**
    - **Open:** Allows you to view SEL data from a previously saved file if it was stored in binary format. Selecting the Open Menu item lets you specify a filename under which the data are found. The default filename is "SELLOG.DAT." If the file cannot be opened, the program displays an error message.
    - **Close:** Closes the SEL viewer.
    - **Save As:** Dumps the SEL data to a file in either binary or text format. The binary file can be retrieved later. This option lets you specify a filename to which the data is saved. The default filename is "SELLOG.DAT." If no data exist, the system displays an error message.
    - **Exit:** Exits the EMP console.
- Connect
- View
    - **SEL Information**: Displays SEL summary information.
    - **All Events**: Displays all events in the SEL.
    - **By Sensor Type**: Displays all events in the SEL generated by a specific sensor type, e.g., voltage, temperature, etc.
    - **By Event**: Displays all events in the SEL of a particular type, for example, by memory or threshold. A pop-up menu lets you select the event type to display. This menu displays all event types that can be generated by the hardware.
- **Settings**: Lets you change several operating parameters for the SEL viewer. This menu displays the following suboptions:
    - **Display HEX/Verbose:** Toggles between HEX mode and interpreted mode of displaying SEL records.
    - **Output Text/Binary:** Specifies whether SEL data is saved to the file in binary format or verbose format.
- **Window**: Gives options for displaying currently open windows.
- **Help**: Provides version information for the SEL viewer and provides help topics on the EMP console.

Sensor Data Record Viewer

The sensor data record (SDR) viewer lets you view the records retrieved from the SDR repository. Options available through the SDR viewer are:

- View all SDR records
- View SDR entries by SDR type
- View SDR summary information
- Set SDR display mode to either Hex or verbose mode
- Close the SDR viewer
- Exit the EMP console

SDR Viewer Menu Options

The SDR viewer menu bar contains the following:

- **File**
  - **Close**: Closes the SDR viewer.
  - **Exit**: Exits the EMP console.
- **View**
  - **Display all Records**: Displays all records from the SDRR.
  - **SDR Type**: Displays the records of a particular SDR type. Select an SDR type from a pop-up menu that displays all of the SDR types available for the hardware.
  - **SDR Info**: Displays the SDR summary information.
- **Settings**: Lets you change operating parameters for the SDR viewer. This menu displays the following suboption:
  - **Display HEX/Verbose**: Toggles between HEX mode and interpreted mode of display.
- **Window**: Gives options for displaying currently open windows.
- **Help**: Provides version information for the SDR viewer and provides help topics on the EMP console.

FRU Viewer

The FRU viewer lets you view data from the server system board FRU information area. Options available with the FRU viewer are:

- View all FRU records
- View FRU summary information
- Set FRU display mode to either Hex or verbose mode
- Close the FRU viewer
- Exit the EMP console

FRU Viewer Menu Options

The following menu options are on the FRU viewer menu bar:

- **File**
    - **Close**: Closes the FRU viewer.
    - **Exit**: Exits the EMP console.
- **View**
    - **Display all Records**: Displays all FRU data, which consist of chassis, board, and product information.
    - **FRU Info**: Displays the FRU summary information.
- **Settings**: Lets you change operating parameters for the FRU viewer. This menu displays the following suboption:
    - **Display HEX/Verbose**: Toggles between HEX mode and interpreted mode of displaying FRU records.
- **Window**: Gives options for displaying currently open windows.
- **Help**: Provides version information for the FRU viewer and provides help topics on the EMP console.

FRU and SDR Load Utility

The Field Replacement Unit (FRU) and Sensor Data Record (SDR) load utility is a DOS-based program used to update the server management subsystem product level FRU, SDR, and the Desktop Management Interface (DMI) nonvolatile storage components. The utility:

- Discovers the product configuration based on instructions in a master configuration file
- Displays the FRU information
- Updates the EEPROM associated with the system board management controller (BMC) that holds the SDR and FRU area
- Updates the DMI FRU area located in the BIOS nonvolatile storage device
- Generically handles FRU devices that might not be associated with the BMC

When to Run the FRUSDR Load Utility

You should run the FRUSDR load utility each time you upgrade or replace the hardware in your server, excluding expansion cards, hard drives, and RAM. For example, if you replace an array of fans, you need to run the utility. It programs the sensors that need to be monitored for server management.

Because the utility must be reloaded to properly initialize the sensors after programming, turn the server off and remove the AC power cords from the server. Wait approximately 30 seconds, then reconnect the power cords and turn on the server.

What You Need to Do

You must run the utility from diskettes provided with the server and you must follow the instructions in the included README.TXT file.

If the diskette drive is disabled, or improperly configured, you must use BIOS Setup to enable it. If necessary, you can disable the drive after you are done with the FRUSDR utility.

How You Use the FRUSDR Load Utility

The utility:

- Is compatible with ROM-DOS Ver. 6.22, MS-DOS Ver. 6.22, and later versions
- Accepts CFG, SDR, and FRU load files (the executable file for the utility is frusdr.exe)
- Requires the following supporting files
  - one or more .fru files describing the system field replaceable units
  - a .cfg file describing the system configuration
  - an .sdr file describing the sensors in the system

Command Line Format

The command line uses several keys. Table 32 lists the keys and their definitions. The basic command line format is

frusdr [-?] [-h] [-d {dmi, fru, sdr}] [-cfg filename.cfg] [-fru filename.fru]

Table 32: Command Line Format Elements

Command	Description
frusdr	Is the name of the utility
-? or -h	Displays usage information
-d {dmi, fru, sdr}	Displays requested area only
-cfg filename.cfg	Uses custom CFG file
-p	Pause between blocks of data
-v	Verbose, display any additional details

Parsing the Command Line

The FRUSDR load utility allows only one command line function at a time. A command line function can consist of two parameters. Example: -cfg filename.cfg. Invalid parameters cause an error message and exit the

program. You can use either a slash (/) or a minus sign (-) to specify command line options. The -p and -v flags can be used in conjunction with any of the other options.

Displaying Usage Information

When the utility is run with the -? or -h command line flags, the following message is displayed when the verbose flag -v is added to the help command:

> FRU & SDR Load Utility Version 2.1 Revision R.1.1
>
> Copyright (c) 1998, Intel Corporation, All Rights Reserved

This utility must be run from a system executing DOS. Running in a Windows DOS box is insufficient and provides incorrect results. Programming the BMC FRU area clears the SDR table; therefore the SDR table must be reprogrammed. Upon completing the programming of the FRU and SDR areas, the server should be rebooted.

The system displays the following information if the -v option is included in the command line.

The /D FRU command may be followed with up to 16 device addresses. These device addresses are used to view up to 16 different FRU areas, instead of the default of displaying the BMC FRU. The arguments following the "-d FRU" are in the same order and value as the NVS_TYPE, NVS_LUN, DEV_BUS and DEV_ADDRESS which are found in the FRU file header in each FRU file. The LUN address is optional. If the LUN address is used, it must start with an 'L'.

> Usage: FRUSDR -d fru (device) [lun] (bus) (addr) (addr2) (etc)
> Example: FRUSDR /D FRU IMBDEVICE L00 00 C0 C2

The configuration file may be used to load multiple FRU and SDR files. In the configuration file, you may define which FRU and SDR areas are to be programmed. Additionally, you may request information from the user or ask the user to choose which areas to program.

Displaying a Given Area

When the utility is run with the -d DMI, -d FRU, or **-**d SDR command line flag, the indicated area is displayed. Each area represents one sensor for each instrumented device in the server. If the given display function fails because of an inability to parse the data present or a hardware failure, the utility displays an error message and exits.

Displaying the DMI Area

Each DMI area displayed is headed with the DMI area designated name. In each area, each field has a field name header followed by the field in ASCII or as a number.

Example:

To display the DMI area, type **frusdr -d dmi** and press ENTER.

Displaying the FRU Area

The FRU area is displayed in ASCII format when the field is ASCII or as a number when the field is a number. Each FRU area displayed is headed with the FRU area designated name. Each field has a field name header followed by the field in ASCII or as a number. The board, chassis, and product FRU areas end with an END OF FIELDS CODE that indicates there are no more data in the area. The internal use area is displayed in hex format, 16 bytes per line.

Example:

To display the FRU area, type **frusdr -d fru** and press ENTER.

Displaying the SDR Area

The SDR nonvolatile storage area is displayed in hex format. The data are separated by a sensor record number X header, where X is the number of that sensor record in the SDR area. The next line after the header is the sensor record data in hex format delineated by spaces. Each line holds up to

16 bytes. The data on each line are followed by the same data in ASCII format; nonprintable characters (ch < 32 || ch > 126) are substituted by a period (.).

Example:

To display the SDR area, type **frusdr -d sdr** and press ENTER.

Using a Specified CFG File

The utility can be run with the command line parameter of **-cfg** filename.cfg. The filename can be any DOS-accepted, eight-character filename string. The utility loads the specified CFG file and uses the entries in that file to probe the hardware and to select the proper SDRs to load into nonvolatile storage.

Displaying the Utility Title and Version

The utility displays its title:

FRU & SDR Load Utility, Version 2.0, Revision X.XX

where X.XX is the revision number for the utility.

Configuration File

The configuration file is in ASCII text. The utility executes commands formed by the strings present in the configuration file. These commands cause the utility to run tasks needed to load the proper SDRs into the nonvolatile storage of the BMC and possibly generic FRU devices. Some of the commands may be interactive and require you to make a choice.

Prompting for Product Level FRU Information

Through the use of a configuration file, the utility might prompt you for FRU information.

Filtering Records From the SDR File

The MASTER.SDR file has all the possible SDRs for the system. These records might need to be filtered based on the current product configuration. The configuration file directs the filtering of the SDRs.

Updating the SDR Nonvolatile Storage Area

After the utility validates the header area of the supplied SDR file, it updates the SDR repository area. Before programming, the utility clears the SDR repository area. The utility filters all tagged SDRs depending on the product configuration set in the configuration file. Nontagged SDRs are automatically programmed. The utility also copies all written SDRs to the SDR.TMP file; it contains an image of what was loaded. The TMP file is also useful for debugging the server.

Updating the FRU Nonvolatile Storage Area

After the configuration is determined, the utility updates the FRU nonvolatile storage area. First it verifies the common header area and checksum from the specified FRU file. The internal use area is read out of the specified.FRU file and is programmed into the nonvolatile storage. The chassis area is read out of the specified.FRU file. Finally, it reads the product area out of the specified FRU file, then the area is programmed into the FRU nonvolatile storage. All areas are also written to the FRU.TMP file.

Updating the DMI FRU Nonvolatile Storage Area

After programming the BMC FRU area, the utility programs chassis, board, and product FRU information to the DMI fields, if the DMI flag follows each FRUAREA command in the configuration file.

Cleaning Up and Exiting

If an update was successfully performed, the utility displays a single message and then exits.

If the utility fails, it immediately exits with an error message and exit code.

Using the Firmware Update Utility

The Firmware Update Utility (FUU) is a DOS-based program used to update the BMC firmware code.

Running the Firmware Update Utility

You need to run the firmware update utility (FUU) only if new firmware code is necessary.

To Run the FUU

1. Create a DOS-bootable diskette. The version of DOS must be 6.0 or higher.

2. Place the firmware update utility (FWUPDATE.EXE) and the *.hex file on the diskette. Make a note of the *.hex file name, because you will need it later.

3. Insert the diskette into drive A and boot to it.

4. At the DOS prompt, run the executable file (FWUPDATE.EXE).

5. The utility displays a menu screen. Select **Upload Flash**.

6. The utility asks for a file name. Enter the name of the *.HEX file.

7. The program loads the file and then asks if it should upload the boot block. Press N to continue.

8. The program next asks if it should upload the operational code. Press Y to continue.

9. Once the operational code has been updated and verified, press any key to continue. Then press ESC to exit the program.

10. Shut the system down and remove any diskettes in the system.

11. Disconnect all AC power cords from the system and wait 60 seconds.

12. Reconnect the AC power cords and power up the system.

Using the Symbios SCSI Utility

The Symbios SCSI utility detects the SCSI host adapters on the system board. Use the utility to:

- Change default values
- Check and/or change SCSI device settings that may conflict with those of other devices in the server

Running the SCSI Utility

When this message appears on the monitor:

Press Ctrl-C to run SCSI Utility...

Press CTRL+C to run the utility. When it appears, choose the host adapter that you want to configure.

Trouble-shooting

Contents

Introduction

If your system does not operate correctly, re-read the instructions for the procedure(s) you have performed. If an error occurs within an application, consult the documentation supplied with the software.

This section identifies solutions to common problems. If the suggestions in this chapter do not resolve your problem, try calling Technical Support.

Computer Virus Notice

Viruses

A virus is a program written with malicious intent for the sole purpose of creating havoc in a computer system. It attaches itself to executable files or boot sectors, so it can replicate and spread.

Some viruses may only cause your system to beep or display messages or images on the screen. Other viruses are highly destructive and corrupt or erase the contents of your files or disks. To be safe, never assume any virus is harmless.

Types of Viruses

Viruses are identified by how they infect computer systems.

- *Program viruses* infect executable program files such as .com, .exe, .ovl, .drv, .sys, and .bin.

- *Macro viruses* infect macro files of programs such as word processing and spreadsheet programs.

- *Boot viruses* attach themselves to a boot record, master boot, FAT, or partition table.

- *Multipartite viruses* are both program and boot infectors.

Virus Contamination

There are many ways a virus can spread and infect your system. However, a virus is inactive until the infected program is executed, or a boot record is read. Thereafter, the virus loads itself into system memory and begins to copy and spread itself.

Disks used in a contaminated system can get infected and, in turn, transfer the virus when used in another system. A virus can also spread via programs downloaded from bulletin boards or the Internet. Remember that viruses cannot appear all by themselves. They have to be written, then spread through direct contact with executable programs or boot sectors.

Protecting Your System

Awareness is the key. You need to learn about the existence of viruses, how they spread, and what to do to protect your system by reducing the likelihood of virus contamination. The following may help:

- Obtain an anti-virus program and make it a habit to scan the system regularly. These programs may be purchased from a local software store or obtained via shareware on the Internet or online service providers such as CompuServe, Prodigy, AOL, or DeltaNet.

- Make backup copies of all files and write-protect the disks.

- Obtain all software from reputable sources and always scan new software for any viruses before installing files.

If you suspect your system has been infected, you must find and remove the viruses immediately using an anti-virus program. Next, reboot your system as follows: shut the system down, then turn it off for at least 15 seconds before turning it back on. This is the only way to ensure the virus does not remain in your system RAM.

Virus Prevention

We stand by the integrity of our products. Our staff takes every precaution to ensure our files are free from viruses. These precautions include the following:

- We use McAfee VirusScan, a leading anti-virus software that detects and removes over 95% of known viruses and provides comprehensive protection including local and network drives, CD-ROMs, floppies, boot sectors, and partition tables. VirusScan also provides advanced protection against unknown viruses. We continuously update and use the most current version of McAfee VirusScan on all of our products.

- All master disks are write-protected and scanned at least twice before release.

- Sample production disks are periodically scanned as an additional quality check.

- All incoming products such as systems to repair, vendor disks, hard drives, and trade-show units are scanned for viruses.

- All systems are given a final test before shipping.

Unfortunately, today's technology makes the creation of newer viruses possible, some of which can elude even the best scanners available. Hence, there is no absolute guarantee of virus immunity on any product. If you think you have received an infected product from us, please contact Technical Support. Our staff will assist you in correcting the problem.

Troubleshooting Checklist

Before turning on the system, make sure that:

- The power cord is connected to the AC power-in connector and an AC outlet.
- The AC outlet is supplying power.
- If a power strip is used, it is turned on, and the circuit breaker is set.
- The voltage selection switch on the system power supply reflects the proper voltage.

Verifying the Configuration

If your system is not operating correctly, the BIOS may contain an invalid configuration parameter. Enter the BIOS program and check your configuration settings, see "BIOS Setup" on page 79 for complete instructions.

Troubleshooting Guidelines

As you troubleshoot your system, keep the following guidelines in mind:

- Never remove the system cover while the system is turned on.
- Do not attempt to open the monitor; it is extremely dangerous. Even if the monitor's power is disconnected, stored energy within the monitor's components can offer a painful or harmful experience.
- If a peripheral such as the keyboard, mouse, drive, or printer does not appear to work, verify that all connections are secure.
- If an error message displays on the screen, write it down, word for word. You may be asked about it when calling Technical Support.
- Only qualified personnel should open the system for maintenance.
- If you feel you are qualified to maintain the system yourself, make certain you are properly grounded before opening the system chassis. See Chapter 1, "System Access", for more information on preventing electrostatic damage to the system.

Solving Problems

This chapter helps you identify and solve problems that might occur while you are using the system.

Resetting the System

Some problems can be solved simply by resetting the system. A system reset clears memory, and resets many registers to initial startup values. If the data in memory or any registers has become corrupt or has been improperly set during operation, a system reset will correct the problem. Table 33 lists the various ways in which the system can be reset.

Table 33: System Reset Methods

Key or Button	Type of Reset
CTRL+ALT+DEL	Soft boot reset, which clears system memory and reloads the operating system.
Reset button	Clear system memory, restart POST, and reload the operating system.
Power off/on	Cold boot reset, which clears system memory, restarts POST, reloads the operating system, and halts power to all peripherals.

Initial System Startup

Problems that occur at initial system startup are usually caused by incorrect installation or configuration. Hardware failure is a less frequent cause.

Checklist

- Are all cables correctly connected and secured?
- Are all cables correctly connected and secured?
- Are the processors fully seated in their slots on the system board?
- Are all ISA and PCI cards fully seated in their slots on the system board?
- Are all switch and jumper settings on the system board correct?

- Are all jumper and switch settings on expansion cards and peripheral devices correct? To check these settings, refer to the manufacturer's documentation that comes with them. If applicable, ensure that there are no conflicts—for example, two expansion cards sharing the same interrupt.

- Are all DIMMs installed correctly?

- Are all peripheral devices installed correctly?

- If the system has a hard disk drive, is it properly formatted or configured?

- Are all device drivers properly installed?

- Are the configuration settings made with the SSU correct?

- Is the operating system properly loaded? Refer to the operating system documentation.

- Did you press the system power on/off switch on the front panel to turn the server on (power-on light should be lit)?

- Are the system power cords properly connected to the system and plugged into a NEMA 5-15R outlet for 100-120 V~ or a NEMA 6-15R outlet for 200-240 V~?

- Is AC power available at the wall outlet?

- If these items are correct but the problem recurs, see "Solving Problems" on page 159.

Running New Application Software

Problems that occur when you run new application software are usually related to the software. Faulty equipment is much less likely, especially if other software runs correctly.

Checklist

- Does the system meet the minimum hardware requirements for the software? See the software documentation.

- Is the software an authorized copy? If not, get one; unauthorized copies often do not work.

- If you are running the software from a diskette, is it a good copy?

- If you are running the software from a CD-ROM disk, is the disk scratched or dirty?

- If you are running the software from a hard disk drive, is the software correctly installed? Were all necessary procedures followed and files installed?

- Are the correct device drivers installed?

- Is the software correctly configured for the system?

- Are you using the software correctly?

- If the problems persist, contact the software vendor's customer service representative.

The System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. Many situations that are easy to correct, however, can also cause such problems; sometimes the problem stems from changes made to the system, such as hardware or software that has been added or removed.

Checklist

- If you run the software from diskette, use a new copy of the software.

- If you run the software from a CD-ROM, try a different disc to see if the problem occurs on all disks.

- If you run the software from a hard drive, run it from a diskette. If the software runs correctly, there is a problem with the copy on the hard drive. Reinstall the software on the hard drive, and run it again. Make sure all necessary files are installed.

- If the problems are intermittent, there may be a loose cable, dirt in the keyboard (if keyboard input is incorrect), a marginal power supply, or other random component failures.

- If you suspect that a transient voltage spike, power outage, or brownout may have occurred, reload the software and run it again. (Symptoms of voltage spikes include a flickering video display, unexpected system reboots, and failure to respond to commands.)

● *Note:*

If you are getting random errors in your data files, they may be getting corrupted by voltage spikes on your power line. If you are experiencing any of the symptoms that might indicate voltage spikes on the power line, you may want to install a surge suppressor between the power outlet and the system power cords.

More Problem-solving Procedures

This section provides a more detailed approach to identifying a problem and locating its source.

Preparing the System for Diagnostic Testing

If the checks described in the preceding pages do not correct the problem, you may need to run some diagnostics programs. Most diagnostics programs require rebooting or the closure of all running software.

To Run Diagnostics

1. Turn off the system and all external peripheral devices. Disconnect all of them from the system, except the keyboard and video monitor.

2. Make sure the system power cords are plugged into a properly grounded AC outlet.

3. Make sure your video display monitor and keyboard are correctly connected to the system. Turn on the video monitor. Set its brightness and contrast controls to at least two-thirds of their maximum ranges (see the documentation supplied with your video display monitor).

4. If the operating system normally loads from the hard disk drive, make sure there is no diskette in drive A. Otherwise, place a diskette containing the operating system files in drive A.

5. Turn on the system. If the power LED does not light, see "Power Light Does Not Light" on page 164.

Using PCDiagnostics

A diagnostics package for the system is provided with the system. For documentation about the test modules, see the Diagnostic help files that end with the extension .HLP. They are ASCII files that you can print to form a manual of all tests in this product.

- The program called Testview uses a simple DOS-based menu system.
- The program called T.EXE is not for Windows or DOS; you can access it at the command line prompt without having a hard drive installed.
- The README.TXT file for diagnostics tells how to install the program.

Monitoring POST

See "Power-on Self Test" on page 127, for more information about the POST utility and its functions.

Verifying Proper Operation of Key System Lights

As POST determines the system configuration, it tests for the presence of each mass storage device installed in the system. As each device is checked, its activity light should turn on briefly. Check for the following:

- Does the diskette drive activity light turn on briefly? If not, see "Diskette Drive Activity Light Does Not Light" on page 167.
- If a second diskette drive is installed, does its activity light turn on briefly? If not, see "Diskette Drive Activity Light Does Not Light" on page 167.
- If there is a hard disk drive or SCSI devices installed in the system, does the hard disk drive activity light on the control panel turn on briefly? If not, see "Hard Disk Drive Activity Light Does Not Light" on page 168.

Confirming the Loading of the Operating System

Once the system boots, the operating system prompt appears on the screen. The prompt varies according to the operating system. If the operating system prompt does not appear, see "Initial System Startup" on page 159.

Specific Problems and Corrective Actions

This section provides possible solutions for these specific problems:

- Power light does not light.
- No beep or incorrect beep pattern.
- No characters appear on screen.
- Characters on the screen appear distorted or incorrect.
- System cooling fans do not rotate.
- Diskette drive activity light does not light.
- Hard disk drive activity light does not light.
- CD-ROM drive activity light does not light.
- Problems with application software.
- The startup prompt "Press <F2> key if you want to run Setup" does not appear on the screen.
- The bootable CD-ROM is not detected.

Try the solutions in the order given. If you cannot correct the problem, contact Technical Support for assistance.

Power Light Does Not Light

Check the following:

- Are all the power supplies plugged in? Is the power turned on to the power strip or outlet? Do you have a blown fuse or breaker?
- Is the system operating normally? If so, the power LED may be defective or the cable from the front panel to the system board may be loose.
- Are there other problems with the system? If so, look under "System Cooling Fans Do Not Rotate Properly" on page 166.

If all items are correct and problems persist, contact Technical Support for assistance.

No Beep Codes

If the system operates normally, but there was no beep, the speaker may be defective. If the speaker is enabled, but the speaker does not function, contact Technical Support for assistance.

No Characters Appear on Screen

Check the following:

- Is the keyboard working? Check to see that the "Num Lock" light is functioning.

- Is the video monitor plugged in and turned on? Many modern video monitors shut down when inactive and may require a moment to warm up when activated.

- Are the brightness and contrast controls on the video monitor properly adjusted?

- Are the video monitor switch settings correct?

- Is the video monitor signal cable properly installed?

- Is the onboard video controller enabled?

If you are using an add-in video controller board, you may need to perform some additional checks.

To Test an Add-in Video Controller

1. Verify that the video controller board is fully seated in the system board connector (and verify that the video monitor is plugged in to the active video controller).

2. Reboot the system for changes to take effect.

3. If there are still no characters on the screen after you reboot the system and POST emits a beep code, write down the beep code you hear. This information is useful for your service representative. See "POST Codes and Countdown Codes" on page 170.

4. If you do not receive a beep code and characters do not appear, the video display monitor or video controller may have failed. You can verify this by trying the monitor on another system or trying a different monitor on this system. Contact Technical Support for assistance.

Characters Are Distorted or Incorrect

Check the following:

- Are the brightness and contrast controls properly adjusted on the video monitor? See the manufacturer's documentation.
- Are the video monitor signal and power cables properly installed?
- Is the correct monitor/video board installed for your operating system?

If the problem persists, the video monitor may be faulty or it may be the incorrect type. Contact Technical Support for assistance.

System Cooling Fans Do Not Rotate Properly

If the system cooling fans are not operating properly, system components could be damaged.

Check the following:

- Is AC power available at the wall outlet?
- Are the system power cords properly connected to the system and the wall outlet?
- Did you press the power on/off push-button switch?
- Is the power-on light lit?

- Have any of the fan motors stopped (use the server management subsystem to check the fan status)?

- Are the fan power connectors properly connected to the system board?

- Is the cable from the front panel board connected to the system board?

- Are the power supply cables properly connected to the system board?

- Are there any shorted wires caused by pinched cables or power connector plugs forced into power connector sockets the wrong way?

If the switches and connections are correct and AC power is available at the wall outlet, contact Technical Support for assistance.

Diskette Drive Activity Light Does Not Light

Check the following:

- Are the diskette drive power and signal cables properly installed?

- Are all relevant switches and jumpers on the diskette drive set correctly?

- Is the diskette drive properly configured?

- Is the diskette drive activity light always on? If so, the signal cable may be plugged in incorrectly.

If you are using the onboard diskette controller, use the SSU to make sure that *Onboard Floppy* is set to **Enabled**. If you are using an add-in diskette controller, make sure that *Onboard Floppy* is set to **Disabled**. To run the SSU, see "Using the System Setup Utility" on page 105.

If the problem persists, there may be a problem with the diskette drive, system board, or drive signal cable. Contact your service representative or authorized dealer for assistance.

Hard Disk Drive Activity Light Does Not Light

If you have installed one or more hard disk drives in your system, check the following:

- Are the power and signal cables to the drive properly installed?
- Are all relevant switches and jumpers on the hard drive and adapter board set correctly?
- Is the onboard IDE controller enabled? (IDE hard drives only)
- Is the hard disk drive properly configured?

CD-ROM Drive Activity Light Does Not Light

Check the following:

- Are the power and signal cables to the CD-ROM drive properly installed?
- Are all relevant switches and jumpers on the drive set correctly?
- Is the drive properly configured?
- Is the onboard IDE controller enabled?

Network Problems

If you have network problems, consult the documentation that came with the network board installed in the server.

PCI Installation Tips

Some common PCI tips are listed here.

- Reserve interrupts (IRQs) and/or memory addresses specifically for ISA adapters. This prevents PCI boards from trying to use the same settings ISA boards are using. Use the SSU to keep track of ISA adapter resources.

- Certain drivers may require interrupts that are not shared with other PCI drivers. You can use the SSU to adjust the interrupt numbers for PCI devices. For certain drivers, it may be necessary to alter settings so that interrupts are not shared.

- Check PCI interrupt interdependencies among slots and onboard devices.

Problems with Application Software

If you have problems with application software, do the following:

- Verify that the software is properly configured for the system. See the software installation and operation documentation for instructions on setting up and using the software.

- Try a different copy of the software to see if the problem is with the copy you are using.

- Make sure all cables are installed correctly.

- Verify that the system board jumpers are set correctly. See "Setting the Jumpers" on page 72.

- If other software runs correctly on the system, contact your vendor about the failing software.

If the problem persists, contact the software vendor's customer service representative for assistance.

Bootable CD-ROM Is Not Detected

Check the following:

- Is the BIOS set to allow the CD-ROM to be the first bootable device?

Error and Informational Messages

When you turn on the system, POST displays messages that provide information about the system. If a failure occurs, POST emits beep codes that indicate errors in hardware, software, or firmware. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message appears.

POST Codes and Countdown Codes

The BIOS indicates the current testing phase during POST after the video adapter has been successfully initialized by outputting a 2-digit hex code to I/O location 80h. If a port-80h ISA POST board is installed, it displays the 2-digit code on a pair of hex display LEDs. Hex codes and their meanings are listed in Table 34.

Table 34: Port-80h Codes and Beep Codes

Port-80 Codes	Beep Codes	Error Descriptions
02		Verify Real Mode
04		Get processor type
06		Initialize system hardware
08		Initialize chipset registers with initial POST values
09		Set in POST flag
0A		Initialize processor registers
0B		Enable processor cache
0C		Initialize caches to initial POST values
0E		Initialize I/O
0F		Initialize the local bus IDE
10		Initialize Power Management
11		Load alternate registers with initial POST values new
12		Restore processor control word during warm boot
14		Initialize keyboard controller
16	1-2-2-3	BIOS ROM checksum
18		8254 timer initialization
1A		8237 DMA controller initialization
1C		Reset Programmable Interrupt Controller
20	1-3-1-1	Test DRAM refresh
22	1-3-1-3	Test 8742 Keyboard Controller
24		Set ES segment register to 4GB
28	1-3-3-1	Autosize DRAM
2A		Clear 512K base RAM

Table 34: Port-80h Codes and Beep Codes (Continued)

Port-80 Codes	Beep Codes	Error Descriptions
2C	1-3-4-1	RAM failure on address line xxxx*
2E	1-3-4-3	RAM failure on data bits xxxx* of low byte of memory bus
30	1-4-1-1	RAM failure on data bits xxxx* of high byte of memory bus
32		Test processor bus-clock frequency
34		Test CMOS
35		RAM Initialize alternate chipset registers
36		Warm start shut down
37		Reinitialize the chipset (MB only)
38		Shadow system BIOS ROM
39		Reinitialize the cache (MB only)
3A		Autosize cache
3C		Configure advanced chipset registers
3D		Load alternate registers with CMOS values new
40		Set Initial processor speed new
42		Initialize interrupt vectors
44		Initialize BIOS interrupts
46	2-1-2-3	Check ROM copyright notice
47		Initialize manager for PCI Option ROMs
48		Check video configuration against CMOS
49		Initialize PCI bus and devices
4A		Initialize all video adapters in system
4B		Display QuietBoot screen
4C		Shadow video BIOS ROM
4E		Display copyright notice
50		Display processor type and speed
51		Initialize EISA board
52		Test keyboard
54		Set key click if enabled
56		Enable keyboard
58	2-2-3-1	Test for unexpected interrupts
5A		Display prompt "Press F2 to enter SETUP"
5C		Test RAM between 512 and 640k
60		Test extended memory
62		Test extended memory address lines
64		Jump to UserPatch1
66		Configure advanced cache registers
68		Enable external and processor caches
6A		Display external cache size
6C		Display shadow message
6E		Display non-disposable segments

Table 34: Port-80h Codes and Beep Codes (Continued)

Port-80 Codes	Beep Codes	Error Descriptions
70		Display error messages
72		Check for configuration errors
74		Test real-time clock
76		Check for keyboard errors
7A		Test for key lock on
7C		Set up hardware interrupt vectors
7E		Test coprocessor if present
80		Detect and install external RS232 ports
82		Detect and install external parallel ports
85		Initialize PC-compatible PnP ISA devices
86		Re-initialize on board I/O ports
88		Initialize BIOS Data Area
8A		Initialize Extended BIOS Data Area
8C		Initialize floppy controller
90		Initialize hard disk controller
91		Initialize local bus hard disk controller
92		Jump to UserPatch2
93		Build MPTABLE for multi-processor boards
94		Disable A20 address line
95		Install CD-ROM for boot
96		Clear huge ES segment register
98	1-2	Search for option ROMs. One long, two short beeps on checksum failure
9A		Shadow option ROMs
9C		Set up Power Management
9E		Enable hardware interrupts
A0		Set time of day
A2		Check key lock
A4		Initialize typematic rate
A8		Erase F2 prompt
AA		Scan for F2 key stroke
AC		Enter SETUP
AE		Clear in-POST flag
B0		Check for errors
B2		POST done – prepare to boot Operating System
B4	1	One short beep before boot
B5		Display MultiBoot menu
B6		Check password (optional)
B8		Clear global descriptor table
BC		Clear parity checkers
BE		Clear screen (optional)

Table 34: Port-80h Codes and Beep Codes (Continued)

Port-80 Codes	Beep Codes	Error Descriptions
BF		Check virus and backup reminders
C0		Try to boot with INT 19
D0		Interrupt handler error
D4		Pending interrupt error
D6		Initialize option ROM error
D8		Shutdown error
DA		Extended Block Move
DC		Shutdown 10 error

POST Error Codes and Messages

The following error codes and messages are representative of various conditions BIOS identifies. The exact strings and error numbers may be different from those listed in Table 35.

Table 35: POST Error Codes

Code	Message
0162	BIOS unable to apply BIOS update to processor 1
0163	BIOS unable to apply BIOS update to processor 2
0164	BIOS does not support current stepping for processor 1
0165	BIOS does not support current stepping for processor 2
0200	Failure Fixed Disk
0210	Stuck Key
0211	Keyboard error
0212	Keyboard Controller Failed
0213	Keyboard locked - Unlock key switch
0220	Monitor type does not match CMOS - Run SETUP
0230	System RAM Failed at offset
0231	Shadow RAM Failed at offset
0232	Extended RAM Failed at offset
0250	System battery is dead - Replace and run SETUP
0251	System CMOS checksum bad - Default configuration used
0260	System timer error
0270	Real-time clock error
0297	ECC Memory error in base (extended) memory test in Bank xx
02B2	Incorrect Drive A type - run SETUP
02B3	Incorrect Drive B type - run SETUP
02D0	System cache error - Cache disabled
02F5	DMA Test Failed

Table 35: POST Error Codes (Continued)

Code	Message
02F6	Software NMI Failed
0401	Invalid System Configuration Data - run configuration utility
None	System Configuration Data Read Error
0403	Resource Conflict
0404	Resource Conflict
0405	Expansion ROM not initialized
0406	Warning: IRQ not configured
0504	Resource Conflict
0505	Expansion ROM not initialized
0506	Warning: IRQ not configured
0601	Device configuration changed
0602	Configuration error - device disabled
8100	Processor 0 failed BIST
8101	Processor 1 failed BIST
8104	Processor 0 Internal Error (IERR) failure
8105	Processor 1 Internal Error (IERR) failure
8106	Processor 0 Thermal Trip failure
8107	Processor 1 Thermal Trip failure
8108	Watchdog Timer failed on last boot, BSP switched
810A	Processor 1 failed initialization on last boot
810B	Processor 0 failed initialization on last boot
810C	Processor 0 disabled, system in uniprocessor mode
810D	Processor 1 disabled, system in uniprocessor mode
810E	Processor 0 failed FRB Level 3 timer
810F	Processor 1 failed FRB Level 3 timer
8110	Server Management Interface failed to function
8120	IOP subsystem is not functional
8150	NVRAM Cleared by Jumper
8151	NVRAM Checksum Error, NVRAM cleared
8152	NVRAM Data Invalid, NVRAM cleared

Reference
Data

Contents

Specifications

System Specifications

The following specifications are for the standard configuration; your system may contain optional equipment. All specifications are subject to change.

Summary	The system supports up to four Pentium II Xeon processors running at 400 or 450 MHz. These processors fit into the slot 2 connectors on the system board. The system also supports seven expansion slots, six LVD SCA SCSI drives, onboard narrow and onboard wide SCSI controller, and a full complement of I/O ports
Dimensions	19.0"H x 12.25"W x 25.0"D, 85–100 lbs.
Processor	Intel Pentium II Xeon processor
Processor speed	400 or 450 MHz
Processor upgrade	Slot 2
Cache subsystem	512 KB, 1 MB, or 2 MB level-2 ECC cache
RAM	256-MB standard, 4-GB maximum
BIOS	Intel
IDE interfaces	One, supporting two IDE devices
Diskette drive	1.44-MB 3.5-inch
I/O Ports	Two serial, one parallel, video, mouse, USB, and keyboard
Mouse/Keyboard	Yes
ISA/PCI Expansion Slots	Seven PCI/ One ISA (One of the PCI slots and the ISA slot are shared)
Certification	FCC Class A, TUV, CE, CSA, and UL approved

Environmental Specifications

The following specifications identify maximum environmental characteristics. At no time should the server run under conditions which violate these specifications.

Table 36: Environmental Specifications

Variable	Requirements
Temperature	Maximum rate of change = 10°C per hour
Nonoperating	–40° to 70 °C (–55° to 150 °F)
Operating	10° to 35 °C (41° to 95 °F); derated 0.5 °C for every 1000 ft (305 m)
Altitude	10,000 ft max
Humidity	
Nonoperating	95% relative (noncondensing) @ 30°C (86°F)
Operating wet bulb	Not to exceed 33 °C (91.4 °F) (with diskette drive or hard disk drive)
Shock	
Operating	2.0 g, 11 msec, 1/2 sine
Packaged	Operational after 30-inch free fall (cosmetic damage might occur)
Acoustic noise	< 50 dBA w/ two power supplies at 28 °C +/- 2 °C < 55 dBA w/ three power supplies at 28 °C +/- 2 °C
Electrostatic discharge (ESD)	Tested to 20 kilovolts (kV) per Intel environmental test specifications; no component damage
AC Input Power	
100-120 V~	100-120 V~, 7.6 A, 50/60 Hz
200-240 V~	200-240 V~, 3.8 A, 50/60 Hz

System I/O Addresses

Table 37 shows the location in I/O space of all directly I/O-accessible registers.

Table 37: System I/O Addresses

Address	Resource	Device	Notes
0000h - 000Fh	DMA Controller 1	PIIX4E	
0010h - 001Fh	DMA Controller 1	PIIX4E	Aliased from 0000h - 000Fh
0020h - 0021h	Interrupt Controller 1	PIIX4E	
0022h - 0023h			
0024h - 0025h	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
0026h - 0027h			
0028h - 0029h	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
002Ah - 002Bh			
002Ch - 002Dh	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
002Eh - 002Fh	Super I/O Index and Data Ports		
0030h - 0031h	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
0032h - 0033h			
0034h - 0035h	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
0036h - 0037h			
0038h - 0039h	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
003Ah - 003Bh			
003Ch - 003Dh	Interrupt Controller 1	PIIX4E	Aliased from 0020h - 0021h
003Eh - 003Fh			
0040h - 0043h	Programmable Timers	PIIX4E	
0044h - 004Fh			
0050h - 0053h	Programmable Timers	PIIX4E	Aliased from 0040h - 0043h
0054h - 005Fh			
0060h, 0064h	Keyboard Controller		Keyboard chip select from 87307
0061h	NMI Status & Control Register	PIIX4E	
0063h	NMI Status & Control Register	PIIX4E	Aliased
0065h	NMI Status & Control Register	PIIX4E	Aliased
0067h	NMI Status & Control Register	PIIX4E	Aliased

Table 37: System I/O Addresses (Continued)

Address	Resource	Device	Notes
0070h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4E	
0072h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4E	Aliased from 0070h
0074h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4E	Aliased from 0070h
0076h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4E	Aliased from 0070h
0071h	RTC Data	PIIX4E	
0073h	RTC Data	PIIX4E	Aliased from 0071h
0075h	RTC Data	PIIX4E	Aliased from 0071h
0077h	RTC Data	PIIX4E	Aliased from 0071h
0080h - 008Fh	DMA Low Page Register	PIIX4E	
0090h - 0091h	DMA Low Page Register	PIIX4E	Aliased
0092h	System Control Port A (PC-AT control Port)	PIIX4E	Not aliased in DMA range
0093h - 009Fh	DMA Low Page Register	PIIX4E	Aliased
0094h	Video Display Controller		
00A0h - 00A1h	Interrupt Controller 2	PIIX4E	
00A4h - 00A15	Interrupt Controller 2	PIIX4E	Aliased
00A8h - 00A19	Interrupt Controller 2	PIIX4E	Aliased
00Ach - 00Adh	Interrupt Controller 2	PIIX4E	Aliased
00B0h - 00B1h	Interrupt Controller 2	PIIX4E	Aliased
00B2h	Advanced Power Management Control	PIIX4E	
00B3h	Advanced Power Management Status	PIIX4E	
00B4h - 00B5h	Interrupt Controller 2	PIIX4E	Aliased
00B8h - 00B9h	Interrupt Controller 2	PIIX4E	Aliased
00BCh - 00BDh	Interrupt Controller 2	PIIX4E	Aliased
00C0h - 00DFh	DMA Controller 2	PIIX4E	
00F0h	Clear NPX error		Resets IRQ13
00F8h - 00FFh	x87 Numeric Coprocessor		
0102h	Video Display Controller		
0170h - 0177h	Secondary Fixed Disk Controller (IDE)	PIIX4E	Not used
01F0h - 01F7h	Primary Fixed Disk Controller (IDE)	PIIX4E	
0200h - 0207h	Game I/O Port		Not used

Table 37: System I/O Addresses (Continued)

Address	Resource	Device	Notes
0220h - 022Fh	Serial Port A		
0238h - 023Fh	Serial Port B		
0278h - 027Fh	Parallel Port 3		
02E8h - 02Efh	Serial Port B		
02F8h - 02FFh	Serial Port B		
0338h - 033Fh	Serial Port B		
0370h - 0375h	Secondary Diskette		
0376h	Secondary IDE		
0377h	Secondary IDE/Diskette		
0378h - 037Fh	Parallel Port 2		
03B4h - 03Bah	Monochrome Display Port		
03BCh - 03BFh	Parallel Port 1 (Primary)		
03C0h - 03CFh	Video Display Controller		
03D4h - 03DAh	Color Graphics Controller		
03E8h - 03EFh	Serial Port A		
03F0h - 03F5h	Diskette Controller		
03F6h - 03F7h	Primary IDE - Sec. Diskette		
03F8h - 03FFh	Serial Port A (Primary)		
0400h - 043Fh	DMA Controller 1, Extended Mode Registers	PIIX4E	
04D0h - 04D1h	Interrupt Controllers 1 and 2 Control Register		
0678h - 067Ah	Parallel Port (ECP)		
0778h - 077Ah	Parallel Port (ECP)		
07BCh - 07BEh	Parallel Port (ECP)		
0CA0 - CA3h	BMC Registers		
0CF8h	PCI CONFIG_ADDRESS Register		Located in 450NX
0CF9h	NBX Turbo and Reset control	PIIX4E	
0CFCh	PCI CONFIG_DATA Register		Located in 450NX
46E8h	Video Display Controller		

Memory Map

Table 38: Memory Map

Address Range (hex)	Amount	Function
0 to 07FFFFh	640 KB	DOS region, base system memory
0A0000h to 0BFFFFh	128 KB	Video or SMM memory
0C0000h and 0DFFFFh	128 KB	Expansion card BIOS and buffer area
0E0000h to 0FFFFFh	128 KB	System BIOS
0E0000h to 0EFFFFh	2 MB	Extended system BIOS
FC000000h to FFFFFFFFh	64 MB	PCI memory space

Interrupts

Table 39 suggests a logical interrupt mapping of interrupt sources; it reflects a typical configuration, but you can change these interrupts. Use the information to determine how to program each interrupt. The actual interrupt map is defined using configuration registers in the PIIX4E and the I/O controller. I/O Redirection Registers in the I/O APIC are provided for each interrupt signal; the signals define hardware interrupt signal characteristics for APIC messages sent to local APIC(s).

Table 39: Interrupts

Interrupt	I/O APIC Level	Description
INTR	INT0	Processor interrupt
NMI	N/A	NMI from PIC to processor
IRQ1	INT1	Keyboard interrupt
Cascade	INT2	Interrupt signal from second 8259 in PIIX4E
IRQ3	INT3	Serial port A or B interrupt from SIO device (you can configure either)
IRQ4	INT4	Serial port A or B interrupt from SIO device (you can configure either)
IRQ5	INT5	Parallel port II
IRQ6	INT6	Diskette port
IRQ7	INT7	Parallel port
IRQ8_L	INT8	RTC interrupt
IRQ9	INT9	Signal control interrupt (SCI) used by ACPI-compliant operating system
IRQ10	INT10	
IRQ11	INT11	
IRQ12	INT12	Mouse interrupt
IRQ13	INT13	Co-processor interrupt
IRQ14	INT14	Compatibility IDE interrupt from primary channel IDE devices 0 and 1
IRQ15	INT15	
SMI_L		System management interrupt—general purpose indicator sourced by the PIIX4E and BMC through the PID to the processors

Video Modes

The CL-GD5480 integrated video controller provides all standard IBM VGA modes. With 2 MB of SGRAM standard, the system supports special Cirrus Logic extended modes. Table 40 and Table 41 list the standard and extended modes that this implementation supports, including the number of colors and palette size (e.g., 16 colors out of 256 K colors), resolution, pixel frequency, and scan frequencies.

Table 40: Standard VGA Modes

Mode in Hex	Bits / Pixel	Colors (#/ Palette Size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)
0, 1	4	16/256K	360 X 400	14	31.5	70
2, 3	4	16/256K	720 X 400	28	31.5	70
4, 5	4	4/256K	320 X 200	12.5	31.5	70
6	4	2/256K	640 X 200	25	31.5	70
7	4	Mono	720 X 400	28	31.5	70
D	4	16/256K	320 X 200	12.5	31.5	70
E	4	16/256K	640 X 200	25	31.5	70
F	4	Mono	640 X 350	25	31.5	70
10	4	16/256K	640 X 350	25	31.5	70
11	4	2/256K	640 X 480	25	31.5	60
12	4	16/256K	640 X 480	25	31.5	60
12+	4	16/256K	640 X 480	31.5	37.5	75
13	8	256/256K	320 X 200	12.5	31.5	70

Table 41: Extended VGA Modes

Mode in Hex	Bits / Pixel	Colors (#/ Palette Size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Memory
58, 6A	8	16/256K	800 X 600	36	35.2	56	1MB
58, 6A	8	16/256K	800 X 600	40	37.8	60	1MB
58, 6A	8	16/256K	800 X 600	50	48.1	72	1MB
58, 6A	8	16/256K	800 X 600	49.5	46.9	75	1MB
5C	8	256/256K	800 X 600	36	35.2	56	1MB
5C	8	256/256K	800 X 600	40	37.9	60	1MB
5C	8	256/256K	800 X 600	50	48.1	72	1MB
5C	8	256/256K	800 X 600	49.5	46.9	75	1MB
5C	8	256/256K	800 X 600	56.25	53.7	85	1MB

Mode in Hex	Bits / Pixel	Colors (#/ Palette Size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Memory
5C	8	256/256K	800 X 600	68.2	63.6	100	1MB
5D	8	16/256K (interlaced)	1024 X 768	44.9	35.5	43	1MB
5D	8	16/256K	1024 X 768	65	48.3	60	1MB
5D	8	16/256K	1024 X 768	75	56	70	1MB
5D	8	16/256K	1024 X 768	78.7	60	75	1MB
5E	8	256/256K	640 X 400	25	31.5	70	1MB
5F	8	256/256K	640 X 480	25	31.5	60	1MB
5F	8	256/256K	640 X 480	31.5	37.9	72	1MB
5F	8	256/256K	640 X 480	31.5	37.5	75	1MB
5F	8	256/256K	640 X 480	36	43.3	85	1MB
5F	8	256/256K	640 X 480	43.2	50.9	100	1MB
60	8	256/256K (interlaced)	1024 X 768	44.9	35.5	43	1MB
60	8	256/256K	1024 X 768	65	48.3	60	1MB
60	8	256/256K	1024 X 768	75	56	70	1MB
60	8	256/256K	1024 X 768	78.7	60	75	1MB
60	8	256/256K	1024 X 768	94.5	68.3	85	1MB
60	8	256/256K	1024 X 768	113.3	81.4	100	1MB
64	16	64K	640 X 480	25	31.5	60	1MB
64	16	64K	640 X 480	31.5	37.9	72	1MB
64	16	64K	640 X 480	31.5	37.5	75	1MB
64	16	64K	640 X 480	36	43.3	85	1MB
64	16	64K	640 X 480	43.2	50.9	100	1MB
65	16	64K	800 X 600	36	35.2	56	1MB
65	16	64K	800 X 600	40	37.8	60	1MB
65	16	64K	800 X 600	50	48.1	72	1MB
65	16	64K	800 X 600	49.5	46.9	75	1MB
65	16	64K	800 X 600	56.25	53.7	85	1MB
65	16	64K	800 X 600	68.2	63.6	100	1MB
66	16	32K	640 X 480	25	31.5	60	1MB
66	16	32K	640 X 480	31.5	37.9	72	1MB
66	16	32K	640 X 480	31.5	37.5	75	1MB
66	16	32K	640 X 480	36	43.3	85	1MB
66	16	32K	640 X 480	43.2	50.9	100	1MB
67	16	32K	800 X 600	36	35.2	56	1MB
67	16	32K	800 X 600	40	37.8	60	1MB
67	16	32K	800 X 600	50	48.1	72	1MB
67	16	32K	800 X 600	49.5	46.9	75	1MB

Table 41: Extended VGA Modes (Continued)

Mode in Hex	Bits / Pixel	Colors (#/ Palette Size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Memory
67	16	32K	800 X 600	56.25	53.7	85	1MB
67	16	32K	800 X 600	68.2	63.6	100	1MB
68	16	32K (interlaced)	1024 X 768	44.9	35.5	43	2MB
68	16	32K	1024 X 768	65	48.3	60	2MB
68	16	32K	1024 X 768	75	56	70	2MB
68	16	32K	1024 X 768	78.7	60	75	2MB
68	16	32K	1024 X 768	94.5	68.3	85	2MB
68	16	32K	1024 X 768	113.3	81.4	100	2MB
6C	8	16/256K (interlaced)	1280 X 1024	75	48	43	1MB
6D	8	256/256K (interlaced)	1280 X 1024	75	48	43	2MB
6D	8	256/256K	1280 X 1024	108	65	60	2MB
6D	8	256/256K	1280 X 1024	135	80	75	2MB
6D	8	256/256K	1280 X 1024	157.5	91	85	2MB
6E	16	32K	1152 X 864	94.5	63.9	70	2MB
6E	16	32K	1152 X 864	108	67.5	75	2MB
6E	16	32K	1152 X 864	121.5	76.7	85	2MB
6E	16	32K	1152 X 864	143.5	91.5	100	2MB
71	24	16M	640 X 480	25	31.5	60	1MB
71	24	16M	640 X 480	31.5	37.9	72	1MB
71	24	16M	640 X 480	31.5	37.5	75	1MB
71	24	16M	640 X 480	36	43.3	85	1MB
71	24	16M	640 X 480	43.2	50.9	100	1MB
74	16	64K (interlaced)	1024 X 768	44.9	35.5	43	2MB
74	16	64K	1024 X 768	65	48.3	60	2MB
74	16	64K	1024 X 768	75	56	70	2MB
74	16	64K	1024 X 768	78.7	60	75	2MB
74	16	64K	1024 X 768	94.5	68.3	85	2MB
74	16	64K	1024 X 768	113.3	81.4	100	2MB
78	16	32K	800 X 600	36	35.2	56	1MB
78	24	16M	800 X 600	40	37.8	60	2MB
78	24	16M	800 X 600	50	48.1	72	2MB
78	24	16M	800 X 600	49.5	46.9	75	2MB
78	24	16M	800 X 600	56.25	53.7	85	2MB
78	24	16M	800 X 600	68.2	63.6	100	2MB
7B	8	256/256K (interlaced)	1600 X 1200	135	62.5	48	2MB

Table 41: Extended VGA Modes (Continued)

Mode in Hex	Bits / Pixel	Colors (#/ Palette Size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Memory
7B	8	256/256K	1600 X 1200	162	75	60	2MB
7C	8	256/256K	1152 X 864	94.5	63.9	70	1MB
7C	8	256/256K	1152 X 864	108	67.5	75	1MB
7C	8	256/256K	1152 X 864	121.5	76.7	85	1MB
7C	8	256/256K	1152 X 864	143.5	91.5	100	1MB
7D	16	64K	1152 X 864	94.5	63.9	70	2MB
7D	16	64K	1152 X 864	108	67.5	75	2MB
7D	16	64K	1152 X 864	121.5	76.7	85	2MB
7D	16	64K	1152 X 864	143.5	91.5	100	2MB

DMA Usage

The following table lists the direct memory access (DMA) channels that the system typically uses and which ones are available for use by add-in devices.

Table 42: DMA Usage

DMA	Resource
0	Cascade
1	Available
2	Floppy Controller
3	Available
4	Redirect Cascade
5	Available
6	Available
7	Available

Regulatory Compliance Statements

Contents

Electromagnetic Compatibility

Table 43 lists the electromagnetic compatibility (EMC) standards to which the server conforms. The following sections provide notices for several nations and regions.

Table 43: EMC Standards

Nation or Region	Standards
USA:	FCC CFR 47 Part 15, Class A
Canada:	IC ICES-003 Class A
Europe:	EN55022, Class A EN50082-1 IEC 801-2 ESD Susceptibility IEC 801-3 Radiated Immunity IEC 801-4 Electrical Fast Transient EN61000-3-2 Limit for Harmonic Current Emissions
International:	CISPR 22, Class A
Japan:	VCCI Class A (CISPR 22 A limit)

FCC Notice

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to FCC CFR 47 Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- Use shielded I/O cables when operating this equipment.

American Users

FC

▼*Caution!*

The Federal Communications Commission warns users that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Notice

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par Industrie Canada.

Attention!

Couper le courant avant l'entretien.

CE Notice

This Information Technology Equipment has been tested and found to comply with the following European directives:

[i] EMC Directive 89/336/EEC amending Directives 92/31/EEC & 93/68/EEC as per:

-    EN 50081-1:1992 according to
     EN 55022:1995 Class A
     EN 61000-3-2:1995 or EN 60555-2:1986
     EN 61000-3-3: 1995

-    EN50082-1:1992 according to
     EN 61000-4-2:1995 or IEC 801-2:1984
     ENV 50140:1994 or IEC 801-3:1984
     EN 61000-4-4:1988 or IEC 801-4:1998

[ii] Low Voltage Directive (Safety) 73/23/EEC as per EN 60950

VCCI Notice

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective action.

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Australia/New Zealand Notice

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to the Australian/New Zealand standard AS/NZS 3548 set out by the Spectrum Management Agency.

Declaration of the Manufacturer or Importer

We hereby certify that this product is in compliance with European Union EMC Directive 89/336/EEC, using standards EN55022 (Class A) and EN50082-1 and Low Voltage Directive 73/23/EEC, Standard EN60950.

Safety Compliance

Table 44 lists the electromagnetic compatibility (EMC) standards to which the server conforms. The following sections provide notices for several nations and regions.

Table 44: Safety Compliance Standards

Nation or Region	Standards
USA:	UL 1950 - CSA 950-95, 3rd Edition
Canada:	UL certified to CSA 950-95 for Canada (product bears the single UL mark for U.S. and Canada)
Europe:	German GS Mark - ERG to EN60950 2nd Edition, with amendments
International:	NEMKO to IEC950 2nd Edition + Amd 1-4 NEMKO - EN60 950 2nd Edition + Amd 1-4 NEMKO - EMKO-TSE (74-SEC) 207/94
Australian / New Zealand	AS/NZ 3548, Class A limits (CISPR 22) AS/NZ 3260 (IEC 950 including national AU deviations)

Caution!

This system may include more than one power supply. You must disconnect all power supplies before servicing.

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